2010

# The Influence of Organizational Culture on the Existence of Systems Employed to Improve Quality of Care in Medical Office Practices

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# The Influence of Organizational Culture on the Existence of Systems Employed to Improve Quality of Care in Medical Office Practices

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

by

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April, 2010

# ACKNOWLEDGEMENT

This achievement would not have been possible without the encouragement of so many people. It is with a warm heart that I express my gratitude to all that have in some way helped me to succeed.

First, I am very thankful to my dissertation committee for their guidance and truly supportive nature. To my chair, Dr. Stephen Mick, who was extraordinarily generous with his time and with his vast knowledge and experience in health services research. He challenged me to think critically and communicate clearly; skills that not only improved my work product substantially, but which will continue to be valuable throughout my career. To Dr. Sarah Hudson Scholle, who was the inspiration behind my initial research questions, allowed me to gain access to the data, and who never let me lose sight of the importance of this research. To Dr. Ernie Steidle for his patience in explaining difficult technical concepts, willingness to review my statistical methods in detail and his quick turnaround time on answering numerous questions. To Dr. Deborah Goetz Goldberg whose experience with related research was invaluable in terms of providing very relevant and timely feedback and for helping set my work in the appropriate context. I would also like to recognize Dr. Kelly Devers who helped me set the groundwork for the initial direction of my study.

I am also very thankful for the wonderful experience I had in my doctoral program, including the knowledge gained and relationships built. In addition, the skills I

learned and the mentoring I received as an employee of NCQA were instrumental in keeping me on course.

My friends and family have always been a constant positive force in my life. I thank my friends who have gone before me in terms of setting the bar high with their academic achievement. To someone with a competitive nature, seeing others realize their lofty goals has been priceless in terms of providing that extra push for me to do the same.

I am also so very appreciative of the motivation and drive my parents instilled in me for success in school and in life. The countless hours of educational board games, times tables and help with homework set the stage for a lifetime of learning. The "my daughter the doctor" comment my father would mention when I was young has always stuck with me and was probably the single most motivating force behind my application to graduate school and has definitely influenced my determination to complete it. My mother's attention to detail, organizational skills and leadership qualities have been an extraordinary example to me. My parents have truly been amazing role models.

Last but certainly not least, I am deeply grateful to the two newest members of my family. To my wonderful husband Mike, who has always encouraged and supported my degree pursuit, has been my sense of calm and who has instilled in me that any challenge we face, we do so as a team. I am very lucky to have him as my partner in life and laughter. Finally, to our son Freddie, whose smile lights up our lives and for whom I hope our unconditional love and support will instill in him that anything is possible.

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# ABSTRACT

THE INFLUENCE OF ORGANIZATIONAL CULTURE ON THE EXISTENCE OF SYSTEMS EMPLOYED TO IMPROVE QUALITY OF CARE IN MEDICAL OFFICE PRACTICES

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A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

Virginia Commonwealth University, 2010

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A frequently cited reason for poor quality of care in the ambulatory care setting is the lack of optimally designed systems to address care for those with preventive or chronic care needs. Organizational theory suggests that culture plays an important role in the shaping of these types of programs.

The purpose of this cross-sectional study is to understand through descriptive and regression analysis of secondary data, the relationship between the existence of cultural characteristics such as collegiality, quality emphasis and autonomy, and the systems employed to improve quality of care within primary care practices. The study uses an

integrated theoretical framework consisting of organizational culture, social network and organizational learning theories to better understand the rationale for the relationships.

The analysis is an outgrowth of a previous National Committee for Quality Assurance (NCQA) project conducted in Minnesota where 300 staff across 42 office practices were asked to answer questions on a self-report survey to assess the presence and function of clinical practice systems. To evaluate organizational culture, validated questions from the work of Kralewski and colleagues were also asked.

Descriptive analysis results showed a large range in consistency of practice system use, with clinical information systems as most used and care management systems as least used. Results of the multivariate analysis showed collegiality and quality emphasis as significantly related to the use of practice systems. More specifically, both collegiality and quality emphasis were seen to positively influence the use of clinical quality evaluation and improvement systems and an emphasis of quality was seen to positively influence the use of clinician reminders and clinical information systems. A statistically significant relationship between autonomy and practice systems use was not seen.

As the study shows that culture does influence the use of certain systems for care improvement, it provides an increased understanding and avenue for intervention/change in the continued quest for improved quality of care. Policymakers and practice leadership may want to focus energy on understanding primarily whether the culture of practices places an emphasis on quality and collegiality. Ultimately it may foster the use of practice systems for quality of care improvement.

# CHAPTER 1 - INTRODUCTION

## Overview

The purpose of this study is to understand the relationship between the existence of specific organizational cultural characteristics such as collegiality, quality emphasis and autonomy and the systems employed to improve quality of care within medical office practices. The study uses organizational culture theory as a plausible framework to better understand the rationale for the relationships between the variables. The information gained from this study will be used to help close the gap in knowledge related to culture and systems of care specifically within these practices, and may help identify what factors may be malleable to help drive quality of care improvement.

This first chapter summarizes the rationale for and significance of the research. It includes a brief review of the existing gaps in quality of care, the need for systems to improve care within medical practices and the importance of measuring culture as an organizational characteristic at this specific organizational level. This is followed by a summary of the purpose of the research, including the study's specific objectives, its significance, an introduction to the theoretical framework and the data sources used for the analysis.

## Background

Research on quality of health care has allowed us to see a clearer picture of how

wide the quality gaps are. In 2001 the Institute of Medicine (IOM) reported that, "between the health care we have and the care we could have lies not just a gap, but a chasm" (p. 1). As a prime example of this gap, the results of a very comprehensive and often cited study published by McGlynn et al. (2003) showed that only about 50% of recommended evidence-based processes for care were adhered to for the average person in the United States. With regard to deficiencies across the system and within each of the organizational levels, the IOM in particular has pointed to the ambulatory care setting and specifically medical office practices (IOM, 2001) as an essential area of focus.

The IOM noted that this quality gap occurs primarily due to the failure of organizations rather than individual clinicians alone. One frequently cited organizational failure in the ambulatory care setting has been the lack of optimally designed processes and clinical systems (i.e., mechanisms for coordination of care, systematic monitoring, reminders, decision support, etc.) to address and improve care for those with preventive or chronic care needs (IOM, 2001). Even in larger medical groups, relatively few of these systems are incorporated into practices (Casalino, et al., 2003b; Solberg, et al., 2005). However, earlier research has shown that when such medical office practice systems are in place, they are positively correlated with improved patient safety and quality of care (Feifer, Ornstein, Nietert & Jenkins, 2001; Leape et al., 1995; O'Connor, Sperl-Hillen, Pronk & Murray, 2001.) Therefore, it would be important from a policy and practice perspective to gain greater insight into what factors may influence the adoption of these systems.

Over time increased emphasis has been placed on the relationship between organizational culture and its influence on organizational structure and performance. The relationship has been studied well in the business literature in relation to organizational resistance to change in strategy and structure (Hinings, Thibault, Slack & Kikulis, 1996). More recently as attention has been turned toward determining the drivers of performance in health care, culture has received increased attention in this arena as well (AHRQ, 2009; Hammons, Piland, Small, Hatlie & Burstin, 2001; Hearld, Alexander, Fraser & Jiang, 2008; Kralewski, Wingert, Knutson, Johnson, 1999; IOM, 1999, 2001; Quality Interagency Coordination (QuIC) Task Force, 2000; Shortell et al., 2001). In particular, insights from management research have pointed to specific organizational features of health care organizations such as workforce characteristics (an aspect of organizational culture) that may hinder successful implementation of innovations to improve quality of care (Nembhard, Alexander, Hoff, & Ramanujam, 2009).

In general, organizational culture is described as the shared values and beliefs that are deeply embedded within the organization. The total culture of an organization may represent a blend of organizational subcultures or dominance of a more influential subgroup or subculture (Schein, 1990). Culture can be distinguished from organizational climate, which describes influences in a particular area at a particular point in time (Schneider, Wheeler, & Cox, 1992; Schein, 1990). Because culture takes more time to change and in general has a stronger impact on organizational performance across areas of functioning than climate, it is likely the more relevant aspect to measure related to the existence of systems and influence on outcomes. Organizational theory suggests that

culture plays an important role in the shaping of organizational structure and systems (Hinings et al., 1996) and has been identified as an important factor to study in this way. Because culture is thought to influence the functioning of organizations, scholars have suggested it be taken into consideration in terms of organizational design, in order to increase the possibility of innovation implementation success (Nembhard et al., 2009; Schein, 1990). Unlike other types of fixed characteristics, organizational culture is potentially mutable and provides an avenue for intervention and effective managerial control (Kralewski, Wingert & Barbouche, 1996; Schein, 1990).

The focus on understanding the relationship between culture and performance in health care has increased over time. In general though, most studies have focused on the hospital as the unit of analysis, where results have been mixed (Shortell et al., 2001). Medical office practice studies on the other hand, in general have been more limited in terms of scope and number, but have been more consistent in terms of findings (Kralewski, Wingert, Knutson, Johnson & Veazie, 1999). Differences in findings at the medical office practice level and the hospital level in terms of significant relationships between culture and performance may be understandable. Organizational theory suggests the link between organizational characteristics and performance may vary by not only the nature of the organization and its work but also by the organizational level that is being considered (Hearld et al., 2008; Rousseau, 1985; Rousseau & House, 1994).

The inclusion of questions related to both medical office practice culture and medical office practice systems within the National Committee for Quality Assurance

(NCQA) Physician Practice Connections Readiness Survey (PPC-RS) provides a unique opportunity to take a closer look at the relationship between these factors.

## Purpose of the Study

The primary purpose of this study is to examine whether there is a relationship between certain cultural characteristics of medical office practices and specific medical office practice systems employed to improve quality of care.

The information gained from this study will be used to build the body of literature related to culture and systems of care specifically within medical office practices, and will help identify what cultural factors may be important to focus on within practices to help drive quality of care improvement. This purpose will be accomplished through the following objectives:

Objective 1: To characterize the degree of variation in medical practice respondents' assessment of culture and of systems use.

Objective 2: To understand whether any of the survey questions representing the three culture constructs and whether any of the survey questions representing the seven domains of practice systems are highly correlated and can be combined into a more reduced set of variables for each construct.

Objective 3: To utilize organizational culture theory as a framework to test whether there is a relationship between medical practice culture and medical practice systems use. The following hypotheses are associated with this objective:

- An emphasis of collegiality will be positively associated with innovative practice systems use in medical office practices.

- An emphasis of autonomy will be negatively associated with innovative practice systems use in medical office practices.
- Quality emphasis will be positively associated with innovative practice systems use in medical office practices.

## Significance of the Study

Given the existence of a quality gap in clinical practice and the call for increased accountability across health care (IOM, 1999, 2001), this study is important and relevant to multiple stakeholders as it focuses on the promotion of processes (systems of care) that have been shown to help achieve quality of care outcomes for priority populations in the ambulatory care setting (Casalino et al., 2003b; Feifer et al., 2001; Fleming, Silver, Ocepek-Welikson, & Keller, 2004; O'Conner et al., 2001; Solberg et al., 2008).

More specifically, the results of the study will be important in:

1) Gaining insight into characteristics that may influence (facilitate or impede) the use of medical office practice systems for care improvement,

2) Understanding why practices might want to nurture certain culture attributes. That is, focusing on a set of organizational characteristics that may provide an opportunity for intervention and/or change by policy makers and system leaders thereby helping to improve care and,

3) Helping build the body of literature focusing on organizational characteristics and medical office practices which is slim as compared to studies done at the hospital level.

This research also helps add to the literature in an area gaining increasing attention in the health policy arena; the medical home, an approach to providing comprehensive primary care that is "accessible, continuous, comprehensive, family-centered, coordinated, compassionate, and culturally effective" and which rests on the importance of well developed systems within medical office practices (Patient-Centered Primary Care Collaborative, 2007).

As demonstrated by a review of literature, significant gaps in knowledge remain in this area. First, as mentioned, while the business literature has been filled with studies of organizational culture, this area is only just picking up steam related to focusing on health care quality. Where studies have been done in health care, they have mostly been done in the hospital setting. It is important to pursue research that applies organizational theory in specific settings of care and organizational levels since results may differ among them (Hearld et al., 2008; Rousseau, 1985; Rousseau & House, 1994).

Second, where studies have been done relating organizational characteristics to performance or quality in health care, many have focused on the structure-outcome relationship where results have been mixed. Within hospital studies, most structure-outcome pairings have resulted in non–significant finding, whereas, while fewer in number, structure-process and process-outcome studies have resulted in less non-significant findings (Hearld et. al., 2008). The study enables further exploration of promising relationships within the structure-process-outcome model.

Finally, many studies focusing on health care have not used validated tools for examination of culture, or have looked at a limited number of practice systems (Hearld et

al., 2008; Scott, Mannion, & Davies, 2003b). Given these limitations, there is a need for additional, rigorous research in the area of organizational culture and its impact on medical office practice structure and process, particularly clinical practice systems.

## Introduction to the Theoretical Framework

Theory has been described by Bacharach (1989) as, "a statement of relations among concepts within a set of boundary assumptions and constraints" (p. 496). He describes the purpose of theoretical statements is to "organize (parsimoniously) and to communicate (clearly)" (p. 496) with the underlying goal to "answer the questions of how, when and why" (p. 498). In general, studies examining structural characteristics in health care have been lacking when it comes to providing a solid theoretical foundation. Most focused on answering questions of 'what' rather than 'how, when and why' (Hearld et al., 2008).

In an effort to provide a solid theoretical foundation, relevant aspects of organizational culture theory will be used to guide this study. Organizational culture theory was chosen and is examined to help relate micro-level interactions or relationships of individuals within medical practices to macro-level patterns of implementing clinical process innovation or systems of care. In addition, components of social network theory and organizational learning theory are used to help explain the mechanisms by which these relationships may work. In particular, social network theory relates the effect of relationships between individuals, groups and networks on organizational response, whereas organizational learning theory relates the effect of learning and adaption on organizational response.

These theories in conjunction may provide a plausible framework to help explain the relationship between the specific culture characteristics examined and the implementation of systems to improve quality of care within the practices.

## Summary of Data Sources

This study will use a secondary data source, specifically from a previous project that included primary survey development and data collection led by the National Committee for Quality Assurance (NCQA). With support from the Robert Wood Johnson Foundation (RWJ), NCQA developed a self-report survey tool (PPC-RS) to assess the presence and function of clinical practice systems in medical office practices. The survey evaluates the extent to which physician practices use information systematically to enhance quality of care for patients. It looks at how well practices are connected to specific sources of information such as other clinicians, new research, evidence based clinical knowledge, and their patients' complete medical histories. The development of this survey in conjunction with related research by NCQA, demonstrated that adopting systematic processes and information technology to establish connections can improve quality of care (Solberg, et al., 2008).

Based upon the interest in exploration of the relationship of culture to the extent of systems present, questions related to a subset of Kralewski's organizational culture components relating specifically to medical office practices were added to the PPC-RS as well. The subset of culture characteristics chosen, including collegiality, quality emphasis and autonomy were thought to be related most closely with the uptake and use of the structural and systems components by physicians for examination in the study. The

probable link between these specific cultural attributes and structural systems has also been supported by research of others (Kaissi, Kralewski, Dowd, Heaton, 2007).

NCQA partnered with the HealthPartners Research Foundation to collect data from medical groups in Minnesota (MN) in the summer of 2005 in collaboration with Institute for Clinical Research Systems Improvement (ICSI), a quality improvement collaborative that includes most of the medical groups and hospitals in the area. As a result, survey data were received from 11 medical groups consisting of 42 medical office practice sites and 300 staff. For this research, medical groups are considered entities in which physicians comprise more than one practice site. Practice sites are entities in which one or more physicians practice together at a single geographic location utilizing the same systems of care. As will be elaborated upon further in the methods section, survey respondents which make up the practice sites will be the primary unit of analysis for this study. Their perceptions of culture and of practice systems are related by the percent of variance explained between the two after adjusting for covariates that characterize practice characteristics.

## Chapter Summary and Overview of Remaining Chapters

This chapter has laid out the need for improved quality of care in the ambulatory setting, and the identification of systems of care as factors that may influence quality of care improvement. It has also highlighted organizational culture as a factor that plays an important part in shaping systems of care. Finally, the chapter highlights the need for the particular study including its significance and the gap it could potentially help fill in the literature.

The remaining five chapters of this dissertation provide a detailed review of the literature, the supporting theoretical framework, methods used to examine the proposed relationships and finally the results of the analyses and conclusions.

In Chapter 2 the relevant literature is reviewed and synthesized to provide further background on related subjects and builds the case for the need and contribution of this study. Topics addressed in more detail are the gap in quality of care, systems in health care related to quality of care improvement, and organizational culture. Previous studies related specifically to the variables of interest are emphasized. The chapter closes with a summary of the gaps in knowledge across all related studies, highlighting the need for this study. In Chapter 3 a review of the supporting theoretical framework for the study is provided. In Chapter 4 methods are reviewed which includes a description of the details behind the research design, data sources, survey development and study sample, variables and measures, validity and reliability and finally the analysis plan. In Chapter 5 study findings are presented, and the implications of these findings are discussed in Chapter 6. The report ends with a list of citations and any relevant reference documents within the appendix.

# CHAPTER 2 – LITERATURE REVIEW

## Overview

In order to understand the need for the study and its importance, the following chapter begins by outlining the magnitude and significance of the health care quality gap. It is followed by a synthesis of the literature in the area of organizational characteristics, specifically systems related to health care delivery and their impact on quality. Finally, the chapter summarizes and synthesizes the literature on organizational culture, specifically related to medical office practices. Each section moves from a more general survey of the literature to a more specific medical office practice focus. The chapter concludes with a visual summary of the current gaps in knowledge of the relationship between these concepts within medical office practices. This helps to demonstrate the need and opportunity for further pursuit of this study area.

## Quality Gap

Donabedian, who many have named the founder or father of quality assessment in health care, highlighted two definitions in particular as core to the meaning of quality of care: the balance of health benefits and harm, and the avoidance of useless care (Donabedian, 1980). In a more recent attempt to define quality, the IOM (1990) identifies the meaning as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (p. 21).

The focus on the measurement of quality of care has been important in and of itself as well as for understanding how to reduce cost without reducing quality, for improving outcomes and for increasing choice options for patients and their families. It has also allowed us to get a glimpse of the state of quality and the existence of quality gaps. Research commissioned by the IOM (2001) has found considerable performance variation across the system: difficulties in translating knowledge into practice and applying technology appropriately and in a safe manner. Investigators describe the current health care system as highly decentralized with complicated layers that clinicians find wasteful and patients often times find confusing. These complications result in gaps in care, coverage and quality which inhibit appropriate, timely and safe care (IOM).

The results of a very comprehensive and often cited study published by McGlynn, et al. (2003) showed that only about 50% of recommended evidence-based processes for care were adhered to for the average person in the United States. There has been recognition of underuse of needed services such as lab tests for patients with chronic disease (Saadine et al., 2002), overuse of services such as unwarranted duplication of tests (The Commonwealth Fund Commission on a High Performance Health System, 2008), and misuse of medical services such as questionable surgical procedures (McGlynn, 1998). There has also been variation in medical practice with unexplained differences in rates of procedures in different parts of the country (Wennberg, 1996), and considerable amounts of morbidity and mortality related to medical error such as adverse drug events and wrong site surgeries (IOM, 1999) across the system as a whole and within each of its levels (Leape et al., 1995).

Despite a great deal of attention and concerted efforts, relatively small improvements have been made over time, and only on certain measures of quality (Saaddine et al., 2006). The National Healthcare Quality Report authored by the Agency for Healthcare Research and Quality (2007) showed only a 1.5% annual increase in 15 quality measures since the year 2000.

In terms of probable reasons for slow progress, it may not be that innovations adopted to improve quality of care are not effective, since they are generally thoroughly tested (Lenfant, 2003), but rather, that they may not be implemented well (Bazzoli, Dyman, Buns & Yap, 2004) and result in innovation implementation failure (Nembhard et al., 2009). Some additional reasons cited for the lack of improvement include: difficulty in quality measurement itself (McGlynn, 1997), lack of routinely available performance data to use for baseline information and benchmarks (Berwick, James & Coye, 2003), lack of adequate investment in information technology (IT) and resources to reward high quality (Bodenheimer et al., 2004; Chenoweth & Kilstoff, 2002; Weick & Sutcliffe, 2001; Rundall et al., 2002) and failure to align organizational culture with performance (Chenoweth & Kilstoff, 2001).

With regard to deficiencies across the system and within each of the organizational levels, the IOM in particular has pointed to deficiencies within the ambulatory care setting and specifically within medical office practices (IOM, 2001) as an essential area of focus. This may be because physician office practices are the type of setting used most often by patients to access health care in the United States for the delivery of both primary and secondary care (National Center for Health Statistics

[NCHS], 2006). In particular, although a small fraction of the physician work force, patients in the United States visit family physicians more frequently than any other specialty (i.e., general internal medicine, pediatrics, ob-gyn, surgeons, etc.) (Green & Fryer, 2002). It is significant to think that if medical problems are successfully resolved at this level then their progression to later stages of needed care at higher levels (hospitals, etc.) might be avoided (Statler, 1989). Many researchers and policy analysts promote the ambulatory care setting as providing rich opportunity for meaningful improvement (Murnaghan, 1973). Examination at this level can be important for understanding the state of care for a majority of patients and for identifying future needs of the system as a whole.

## Organizational Characteristics

The IOM's 2001 publication, Crossing the Quality Chasm generated an increased interest in the examination of organizational characteristics of the health care system related to health care quality. This was due in part to the reference of poor quality of care as a systems problem rather than one of individual effectiveness or ineffectiveness. Given the significance and magnitude of the complexity of health care organizations and the integral role they play in affecting systems of care and influencing providers and patients, the report also emphasized a push to improve not only care itself but to improve the organizations that provide that care as well.

Interestingly, although there has been an increased focus of research in this area and recognition of its importance, in general there has been no clear consensus with regard to results relating organizational characteristics to quality. This may be due in part

to differences in sample sizes (which have tended to be smaller and may involve some bias), data sources, the levels at which the studies have been conducted, the variables chosen to represent the organizational characteristic constructs and the specific measure definitions of the variables.

Three separate large-scale reviews have been done over the span of a little over 10 years (1997-2008) to evaluate the relationship between organizational characteristics and quality of care. The first, by Mitchell and Shortell in 1997 looked broadly at studies focusing on the relationship between health care organizational characteristics and the outcomes of adverse events and mortality, the second by Hoff, Jameson, Hannon and Flink in 2004 looked at studies of health care organizational characteristics, errors and patient safety; while the third, by Hearld et al. (2008), looked specifically at studies of organizational structure and processes of hospitals and their relationship to quality of care.

The totality of this research has suggested a few major conclusions: First, most of the studies done in this area have been done at the hospital level of analysis, have focused on the structure-outcome relationship and have been plagued by non-significant findings. As a result, the authors suggest that continued research should focus on lower organizational levels or within specific care giving units (departments or teams within hospitals or within individual primary care clinics) since variation has been seen in both processes and outcomes across these types of units. This is important since organizational theory has suggested that the relationship between organizational factors or characteristics and performance may vary by their level of measurement (Rousseau,

1985; Rousseau & House, 1994; Scott, Ruef, Mendel, & Caronna, 2000). Next, the authors suggest that continued research should focus on interorganizational studies between hospitals and other types of organizations such as nursing homes or physician organizations, and finally, the theoretical foundations of research on structural characteristics and outcomes should be strengthened regardless of the study setting.

## Systems of Care

Interestingly, in contrast to the inconsistency in findings across organizational characteristics in general and in concert with the recommendations to focus research on lower levels of organizations and on process-outcome relationships, studies have shown that well defined clinical practice systems (i.e., mechanisms for routine communication and delivery of services within such domains as decision support, delivery system redesign or clinical information systems) in the ambulatory setting are related to improved outcomes. Some examples of improved outcomes include the initiation and persistence of appropriate medication therapy and the receipt of appropriate lab testing for patients with chronic disease (Solberg et al., 2008a; Solberg et al., 2008b).

Practice systems, have been defined as, “organized processes designed to ensure that certain information is collected and information or services are provided routinely to patients or health care personnel” (Solberg et al., 2008) (p. 421). Within Donabedian’s quality assessment framework as referred to earlier, which includes the dimensions of structure (stable characteristics such as size and ownership that facilitate the provision of health services), process (the actual provision of services or procedures used or manner in which practitioners interact with patients) and outcome (changes in a patient’s health

status as defined by their morbidity and mortality), the majority of systems of care fall into the category of process (Donabedian, 1980; Hearld et al., 2008), although some may be thought of as structural in nature. Donabedian suggests that once certain processes have been established as being associated with good results, "the mere presence or absence of these procedures in these situations can be accepted as evidence of good or bad quality" (p. 83).

These types of practice systems have also been called care management processes (CMPs), organizational process innovations or clinical process innovations (CPIs) by other authors (Shortell & Rundall, 2003; Shortell et al., 2001). Rogers (2003) describes innovations as types of practices or policies new to a particular organization (although they may have already been adopted by others). Certain studies have demonstrated that these organized process innovations or systems of care provide consistency and comprehensiveness for improved quality of care related to the delivery of preventive and chronic care services (Casalino et al., 2003b; Feifer, et al., 2001; Leape et al., 1995; O'Connor, et al., 2001, Solberg et al., 2008.) Related to this, the IOM (2001) noted that a frequently cited reason for poor quality of care, especially in the ambulatory care setting, is the lack of these types of optimally designed processes & clinical systems needed to address care for those with preventive or chronic care needs.

The IOM (2001) suggests movement toward implementation of practice systems centered on patient needs and the design of care processes with application of information technology and engineering concepts. These practices can potentially be learned from other high-risk industries like commercial aviation and the military, where

they have led to increased quality and safety (IOM; Perrow, 1984; Perrow, 1994). Entities known as High Reliability Organizations (HROs) "exist in such hazardous environments where the consequences of errors are high, but the occurrence of error is extremely low" (Baker, Day & Salas, 2006) (p. 1576). HROs highlight factors of centralization and simplification, increased feedback and team based approaches to reducing errors (Roberts, 1990a). Although the concept of HROs has been in existence for more than two decades (Roberts, 1990b), it has only more recently come into focus in health care with the publication of To Err is Human (IOM, 2001) and with the emphasis of patient safety by the AHRQ. In an effort to promote this idea further in health care, because health care professionals have historically tended to practice independently from one another, Baker et al. (2006) discuss the importance of teams and teamwork as essential components in achieving high reliability within these types of organizations.

While appealing, the idea of adapting the HRO framework to health care does not come without its challenges. In order to move forward successfully, Baker et al. (2006) calls for development of a comprehensive model of team performance and the use of proven instructional strategies for team-training programs, adapted specifically to health care settings and institutionalized within them (Baker et al., 2006). In the literature thus far, Hoff et al. suggests that all organizational levels have been seen as important and no one specific variable has been identified as responsible for error reduction (Hoff et al., 2004). Hoff et al. (2004) suggest in order for these types of strategies to work successfully in health care, there must be a focus on more narrow approach to reducing errors and enhancing safety.

Another framework that promotes the use of systems for error reduction and improved performance is the Chronic Care Model as developed by Edward Wagner and colleagues (Bodenheimer, Wagner & Grumbach, 2002a, 2002b; Wagner, 1998). This model suggests that the key to quality improvement lies in the generation of a patient-centered microenvironment through the acceptance and implementation of a variety of systems to provide care that is comprehensive and reliable and through the promotion of productive interactions between patients and health care practitioners (Von Korff, Gruman, Schaefer, Curry, & Wagner, 1997).

Evidence has been found supporting the six specific domains of care organized within the model (health system, delivery system redesign, decision support, clinical information systems, self-management support, and community resources) and many of its elements. Overall, results point to the positive relationship between design features of the model and their use in successful programs (O'Conner et al., 2001). In addition, improved quality of care outcomes for patients with chronic disease in a variety of settings has been observed (Fleming et al., 2004).

In a review of studies published in the US and internationally since 2000 on medical practices that redesigned their systems to incorporate at least four of six elements of the model, evidence shows that quality of care and outcomes have generally improved for patients within these practices (Coleman, Austin, Brach & Wagner, 2009). In an earlier review of the literature by Bodenheimer and colleagues (2002b) to evaluate the use of the chronic care model, the authors indicated that "thirty-two of 39 studies found that interventions based on chronic care model components improved at least one process

or outcome measure for diabetic patients" (p. 1909). Tsai, Morton, Mangione and Keeler (2005) found that interventions with at least one element from the chronic care model showed improved processes of care and outcomes and in certain circumstances, improved quality of life. In a similar fashion, an investigation by Vargas et al. (2007) found that implementation of the chronic care model in practices reduced cardiovascular risk factors in patients with diabetes.

In terms of the evidence supporting specific elements of the chronic care model, a study done by Feifer et al. (2001) evaluated the relationship between systems supports for chronic care and clinical outcomes in diabetes and cardiovascular diseases. Their study found that across practices evaluated, decision support, patient self-management and care delivery design showed a positive linear relationship with clinical performance. In a systematic review of more than 70 studies, Kawamoto, Houlihan, Balas, Lobach (2005) found the use of clinical decision support systems such as patient or clinician reminders showed improved quality of care with their use. In addition, studies evaluating electronic prescribing practices showed their use may be valuable in helping to avoid error, reduce cost and improve patient safety (McMullin, Lonergan & Rynearson, 2005).

## Systems Use in Medical Office Practices and Factors Influencing Adoption

Although there have been reviews in the literature evaluating the existence of elements of the chronic care model within chronic disease care programs, there has been little information in the medical literature evaluating the extent to which medical office practices are implementing practice systems of care overall. Of the few studies that are available that are based on self-report data from medical groups, adoption and consistent

use of systems has been shown to be low (Burt & Sisk, 2005; Casalino et al., 2003b; Solberg et al., 2005). Although advancements have been made in understanding what types of practices can reduce variation and improve quality of care, it seems it has been difficult to facilitate the use of these types of practices by physicians and other health professionals (Shortell & Rundall, 2003).

In a study by Casalino et al. (2003b), which examined the presence of four types of practice systems (called care management processes-CMPs) across four chronic conditions (16 in total) in 1040 larger physician organizations (20-plus physicians), a mean of five CMPs per group was found. This was surprising to the researchers given the size of the groups, which they believed should have allowed them access to the resources to implement such systems. The study showed that CMP use was associated with information technology implementation and external incentives (i.e., financial incentives and public reporting). In a study to document the existence and use of practice systems and the relationship between practice systems and adoption of electronic medical records (EMRs) in medical groups (n=11) in Minnesota, Solberg et al. (2005) found that although each medical group had some component of each practice system present, most practice systems were not used consistently. The groups with EMRs more consistently used practice systems than the groups that did not have an EMR (Solberg et al.). In a study to evaluate the extent of adoption of diabetes care management processes and the organizational factors that influence their adoption, Li et al. (2004) found that less than 50% of physician organizations used none or one diabetes care management process of the four that were examined. Factors that were associated with adoption included external

incentives, computerized information systems and ownership by hospitals or health maintenance organizations. In a study by Bodenheimer and colleagues (2004) to understand facilitators and barriers to physician organizations' use of CMPs, about 50% of the organizations had implemented CMPs minimally or not at all. Strong leadership and an organizational culture valuing quality were mentioned most frequently by personnel as facilitators to CMP use. In Coleman and colleagues' (2009) review of the literature to evaluate the chronic care model's effectiveness in practice redesign, it was found that although many types of practices have used the model, most experience pertains to those practices of larger size, with IT and other resources available.

## Systems Measurement in Medical Office Practices

Given the intricacies of health care organizations (particularly medical groups) and the important role they play in affecting care, there has been an increased interest in systems measurement by stakeholders. Although valid and reliable tools for systems measurement are needed, few exist.

Given this need, the National Committee for Quality Assurance (NCQA) developed and tested a self-report survey tool to assess the presence and function of clinical practice systems called the Physician Practice Connections Readiness Survey (PPC-RS) (Scholle et al., 2008; Solberg et al., 2005; Solberg et al., 2008). The survey was designed to evaluate the extent to which physician practices use information systematically to enhance quality of care for patients and was also designed to be a quality improvement tool for practices.

The extent of "systemness" is determined by how well the practice is connected to specific sources of information such as other clinicians, new research, evidence-based clinical knowledge, and their patients' complete medical histories. The tool identifies the existence of systems within the following domains: registry, clinical information systems, systematic monitoring, clinician reminders, performance tracking and feedback, clinical quality evaluation and improvement, and care management.

Registries allow for grouping of patients by diagnoses and other parameters, and then using those groupings to assist in the provision of care. Clinical information systems are associated with a database of key patient population information that can also help to manage patient care. Systematic monitoring involves the use of a database to monitor key indicators of chronically ill patients' medical conditions for information that may require immediate attention. Clinician reminders are special communications intended to help the office team adhere to best practices for the care of individual patients. Performance tracking and feedback include using clinical information systems to aggregate key indicators from a patient registry or other data sources for the purposes of benchmarking performance and informing improvement activities. Clinical quality evaluation and improvement is a formal process to assess care, develop interventions, and use data to monitor the effects. Care management is a set of defined services for managing patients with chronic illness involving multiple practitioners and care between office visits.

The tool was developed through an extensive literature search and was based upon prior research from the IOM (1999 & 2001), Stephen Shortell and colleagues and their work on the National Study of Physician Organizations and the Management of

Chronic Illness (NSPO) (http://nspo.berkeley.edu/), the Chronic Care Model (Wagner, 1998; Bodenheimer, Wagner & Grumbach, 2002a, 2002b) and the Six Sigma process. The Six Sigma process fostered by General Electric, is an organizational quality system focused on reducing errors, saving dollars and satisfying customers (Pande, Neuman, Cavanagh, 2000) showing that adopting systematic processes and information technology to establish connections, can improve quality of care. The Six Sigma method was used to identify deficiencies in systems that lead to failures in care. The scientific literature was evaluated to help determine which practice systems had a link to positive health outcomes. Interestingly, the work products of the literature search and Six Sigma method resulted in similar findings on which systems of care matter. Through a separate study, the self-report survey tool developed by NCQA demonstrated that the presence of practice systems overall and within specific domains was associated with high-quality of care for patients with diabetes (Solberg et al., 2008).

A version of the tool is now being used by the American Board of Internal Medicine (ABIM) to encourage wider knowledge and use of systems as a means for improving quality, by certain health plans that are paying for use of systems in office practices and also as a component of the Bridges to Excellence, pay for performance program. Bridges to Excellence is a not-for-profit organization whose mission is to reward health care providers who reengineer care processes to reduce mistakes. While evaluation of practices against the tool will not automatically qualify them as a patient-centered medical home, practices that are in conformity with the requirements will be aligned with many of the principles. The Physician Practice Connections® – Patient-

Centered Medical Home™ (PPC®-PCMH™), a NCQA program whose mission is to identify primary care practices that function as patient centered medical homes, uses a National Quality Forum endorsed version of the survey tool as part of the Patient Centered Medical Home demonstration projects.

## Organizational Culture

Over time increased emphasis has been placed on the relationship between organizational culture and its influence on organizational structure and performance. In general, culture is described as the shared values and beliefs deeply embedded within an organization that help to develop its character and norms, whereas organizational climate, a related factor, describes influences in a particular area at a particular point in time (Schein, 1990; Schneider et al., 1992). Because culture takes more time to change than climate and in general influences organizational performance across areas of functioning, it is likely the more relevant aspect to measure related to the existence of systems and influence on outcomes.

Although mutable, given that culture develops over an extended period of time, culture change may not come easily. In a review of the literature to evaluate the implementation of culture change, Scott et al., 2003a lists several factors that appear to impede this type of change including: inadequate leadership, external influence, lack of ownership, and subcultural diversity. Scholars have noted that leaders may need to implement several different tactics to produce the change they are looking for (Schein, 1990). Examples of these tactics include: highlighting threats if no change occurs while also promoting the positive, feasible aspects of change; providing a very clear new

direction; bringing in new staff who are proponents of and who exemplify the new culture; rewarding direction toward the new culture and punishing actions that favor the past; coercing staff into assuming the new culture; showing examples to discredit dysfunctional traditions and creating emotionally charged rituals and symbols around the new assumptions to be embraced (Schein, 1990).

## Subculture

Any defined group with a common history can have a culture, but within that group subcultures can also exist (Schein, 1990). In this way it is possible for the group to lean toward consistency but at the same time for subgroups to have cultures that may be independent or conflict with each other (Schein). The competing values framework of organizational culture acknowledges that many cultures and values may coexist within an organization and compete for attention (Cameron and Freeman, 1991; Quinn and Rohrbaugh, 1981; Quinn and Kimberly, 1984). The total culture of an organization may reflect a blend or dominance by one or more influential subcultures (Schein, 1990).

This is important to note as it may have an impact on how culture evaluation tools are designed, who they are administered to and also on study findings. For example, it would be important to know if the culture of a group is strong and unified, whether perceptions of culture differ by subgroup, or whether one subgroup in general represents the culture of the majority (having more powerful influence on the formation of norms (Hogg & Adams, 1988). Interestingly in terms of facilitating culture change, Schein (1990) suggests that strong subcultures may aid in the change process if leaders can be drawn from subcultures that represent the direction in which the organization needs to go.

On the other hand, as mentioned previously, Scott et al. (2003a) list subcultural diversity as a factor that appears to impede culture change across settings.

In a review article related to implementation of culture change, Scott et al. (2003a) list several categories of subcultures that exist within the United Kingdom National Health Service including ethic, religious, class, gender, occupational and clinical specialty subgroups. Additional research findings have shown characteristics such as age, gender, location of units and job function, years in the organization, significance of roles and education separate workers into subgroups within organizations (McDonald, Corrigan, Daly and Cromie, 2000; Parker, 2000). In a study by Reynolds (1986) to create and test reliable measures of organizational culture, findings showed that organizational culture differed between individuals in various organizational positions. A study of eight manufacturing plants that evaluated employee involvement in programs showed that those in higher status positions were less likely to participate for fear it would undermine their control (Klein, 1984).

Previous studies in health care have also provided similar types of results. Shortell, Rousseau, Gillies, Devers and Simons (1991) examined culture in intensive care units (ICUs) and found that answers to culture questions differed depending on staff discipline (i.e., physicians or nurses) and type of shift. This difference in type of response by staff characteristics caused rewording of survey questions to address the issue. Kinnuken's study (1990) within a primary health care organization found differences between subcultures across types of jobs including whether staff were physicians, nurses or managers.

## Organizational Culture in Health Care

As attention has turned toward determining the correlates of performance in health care, and as traditional approaches have not been able to identify why certain organizations are more effective or efficient than others, culture has received increased attention in this arena (AHRQ, 2009; Hammons et al., 2001; Hearld et al., 2008; Kralewski et al., 1999a; IOM, 1999, 2001; Quality Interagency Coordination (QuIC) Task Force, 2000, Shortell et al., 2001). In particular, insights from management research have pointed to specific organizational features of health care organizations such as workforce characteristics (an aspect of organizational culture) as aspects that may hinder successful implementation of innovations to improve quality of care (Nembhard et al., 2009). In general, "most agree that the successful implementation of health care quality improvement programs ultimately requires an appropriate organizational context from which it must take root" (Rondeau & Wagar, 2002) (p. 17).

With respect to understanding the relationship between culture and performance in health care, the ability to measure specific aspects of both becomes important in revealing relationships. In addition, culture measurement instruments need to be specific enough to study the particular environment of interest. In a review of studies by Scott et al. (2003c) to understand whether culture influences health care performance, four of ten studies found evidence to this end. In particular, compelling evidence from a study by Gerowitz, Lemieux-Charles, Heginbothan & Johnson (1998) showed that health care organizations do differ in terms of their cultures, these cultural attributes are associated with organizational performance and the relationship between culture and performance

will likely be complex. Although the six other studies within the Scott review did not show clear evidence of a relationship between culture and performance, they also did not find evidence against the relationship either.

## Practice Culture Evaluation Tools

Lack of extensive evidence to show organizational culture as an important factor influencing quality of care in physician office practices may be due to the shortage of rigorous instruments and studies specifically related to group practice cultures. In general, a majority of the studies have taken place at the hospital level and/or involve the usage of general rather than specific instruments for evaluation. The lack of agreement around the precise meaning of organizational culture has also hindered the development of standardized measurement tools (Scott et al., 2003b).

A review of the literature by Scott et al. in 2003b, showed that from an initial review of 1700 records focusing on organizational culture, 84 studies reported the development or use of organizational culture measurement tools. From these studies, 13 organizational culture assessment tools were identified that were quantitative, had face validity to assess a broad array of dimensions and address different layers of culture, and provided information on validity and reliability. Nine of the instruments were previously used in a health services research setting, though only one was specifically developed for ambulatory care practices.

Of the 13 tools, a majority followed a dimensional approach (resulting in describing culture by its position on a number of continuous variables (usually via a likert scale)) while fewer followed a typological approach (resulting in categorizing culture into

one of several “types”). Certain tools were grounded in a solid theoretical base, while others were developed through what seem to be unclear origins. Scope varied among the tools, with some instruments focusing on fewer more broad categories of culture (such as climate, leadership style, bonding systems and prioritization of goals), while others on many more comprehensive detailed dimensions (such as orientation to customers, to employees, congruence among stakeholders, impact of mission, managerial depth, decision-making, communication, human scale, motivation, cooperation, organizational congruence, and performance under pressure). Finally, only very few of the instruments explored deeper aspects of culture such as values and beliefs, rather than just perceptions and opinions which seem to tie more closely with organizational climate (Scott et al., 2003b).

As mentioned, within the Scott review, only one instrument was found to be developed specifically for ambulatory care practices (the Practice Culture Questionnaire (Stevenson, 2000)), while some of the others, such as the competing values framework have been adapted for use in this type of setting since. The Practice Culture Questionnaire measures primary care practices’ attitudes to and engagement with quality improvement, clinical governance and resistance to change. Developed empirically in the United Kingdom (UK), it uses a dimensional approach to measuring culture via a 5-point likert scale, producing both a mean (average culture score) and range (level of cohesion). Generality of the survey outside the UK is unclear, and the survey does not address the basic assumptions or broad view of culture (Scott et al., 2003b).

When evaluating the culture of medical group practices, it is important that the instrument is specific enough to the attributes of that specific type of organization. Scott et al., (2003b) emphasized that the instrument chosen should be based on how the researchers, "conceptualize culture, the purpose of the investigation, the intended use of the results and the availability of resources" (p. 923). Given the importance of developing a tool specific to medical practice cultures and the lack of available instruments, in 1996 Kralewski and his colleagues set out to develop such an instrument, and through testing and refinement, published in 2005 the results and end product of that process. They built an instrument that had face validity with medical group practices and which successfully differentiated culture in different types of practices (Kralewski, Dowd, Kaissi, Curoe & Rockwood, 2005).

Their initial 1996 model was based upon the work of Paul Reynolds, PhD, an organizational psychologist at the University of Minnesota. Reynolds reviewed relevant literature on organizational culture, and identified 14 aspects that were prominent across most in the areas of organizational context, work values and work beliefs. Reynolds created a questionnaire based on these dimensions and tested it with a diverse group of business organizations, finding that 12 of the dimensions were effective at differentiating among organizations (Reynolds, 1986). The dimensions and short descriptions are as follows: external versus internal emphasis, focusing on either satisfaction of clients or internal organizational activities; task versus social focus, emphasizing either work or personal needs of team members; safety versus risk, emphasizing either cautious actions or a tendency to produce change when presented with new opportunities; conformity

versus individuality, encouragement of either uniformity or more tolerance for distinctiveness in work and social aspects; individual versus collective decision-making, either individuals make decisions and implement actions or there is more of a collective decision-making process; centralized versus decentralized decision-making, where key individuals at specific organizational levels have decision-making authority or individuals or groups at any level of the organization have the ability to make decisions; stability versus innovation, either being reluctant to adopt anything new that has not been well tested or willing to adopt any new bright idea; cooperation versus competition, working together as a team to compete against external competitors or seeing internal peers as competitors; simple versus complex organization refers to the degree of complexity of procedures and rules within an organization; informal versus formalized procedures refers to the degree to which formal justification exists for all rules and procedures; high versus low loyalty, the degree to which other groups such as families are placed above the organization in terms of priority; and finally, ignorance versus knowledge of organizational expectations relates to whether team members know what is expected of them.

This Reynolds' framework was used as a starting point by Kralewski et al. because it integrated alternate theories of organizational culture, and it tested the culture instrument empirically. The Reynolds model was translated into a group practice culture instrument by surveying physicians who were medical directors in those organizations. The physicians were asked to provide statements describing their culture in each of the 12 areas identified by Reynolds. Through an iterative process, different sets of physicians

were asked to score each item on a scale of 1-5 in terms of the degree to which the statement described their practice cultures. Factor analysis was used to aggregate the statements into the cultural dimensions for the survey. The final instrument contained the following culture components: collegiality, information emphasis, quality emphasis, organizational identity, cohesiveness, business emphasis, organizational trust, innovativeness, and autonomy. Collegiality reflects a strong sense of belonging to the group and a strong sense of responsibility to help colleagues with personal problems. Information emphasis reflects the technical side with an emphasis on information based decision-making. Quality emphasis represents the encouragement of adverse event reporting and organized oversight where quality of care is goal number one. Organizational identity represents the view that staff are members of a group practice organization and are part of decision-making. Cohesiveness represents valuing organizational level approaches to care. Business emphasis represents how financial performance and profits dominate the culture. Organizational trust represents open communication. Innovativeness represents being on the cutting edge of care. Autonomy emphasizes physician individuality, where each physician has the right to practice according to his/her own style. This dimension may represent the opposite side of a practice's orientation toward collegiality, cohesiveness and/or organizational identity (Kralweski et al., 2005).

The testing and refinement of the tool showed that it captured important dimensions of practice cultures and identified cultural differences among practices.

Kralewski's tool was not included in the review by Scott et al. (2003b) as it was finished subsequent to the review's publication.

Based upon the interest in exploration of the relationship between culture and the implementation of systems within medical office practices, questions related to a subset of Kralewski's culture components were also added to NCQA's PPC-RS. The subset of culture characteristics chosen, including collegiality, quality emphasis and autonomy were thought by the researchers to be related most closely with the uptake and use of the structural and systems components by physicians for examination in the study. The probable link between these specific cultural attributes and structural systems has also been supported by research of others. In a study to evaluate the effect of the fit between organizational culture and structure on medication errors in medical group practices, Kaissi, Kralewski, Dowd & Heaton (2007) chose autonomy, collegiality and quality emphasis as the three culture variables to evaluate because, "these variables are expected to influence physician adoption and use of the structural components included in the analyses" and have "the strongest theoretical argument" (p. 16). Additional support for use of these variables is as follows.

Nembhard et al. (2009) proposes that the nature of work and workforce characteristics are two reasons for innovation implementation failure in health care organizations. They suggest that clinical discretion for decision making, an established hierarchy and risk aversion are industry features that impede success. Related to autonomy (a culture that values physician individuality), the authors suggest that health professionals have the liberty to avoid innovation implementation given their discretion

over clinical practice. In addition, Kaissi et al. (2007) suggest that where physician autonomy is strong, benchmarking and guideline use will be less likely. Also, the more autonomous health care staff, the more limited an organization's ability to foster collegiality (a culture that values communication and collaboration) on the road to implementation success (Nembhard et al., 2009). Kaissi et al. (2007) suggest that teamwork and cooperation between health care professionals will help promote adoption of care management practices. Shortell et al. (2001) found that physicians were more likely to implement guidelines when they felt more aligned with their colleagues and the organization. Finally, related to quality emphasis (a culture that values open discussion of adverse events and of clinical failures without fear of blame—two risky behaviors), Nembhard et al. suggest that health care organizations are generally risk averse, which may contribute to implementation failure. Although when they are involved in measurement and efforts are rewarded, success is more likely.

Additional support for the use of these variables is also presented in the next section, which reviews the results of studies linking practice culture attributes to systems use.

## Practice Culture Evaluation Findings

As detailed below, based upon both quantitative and qualitative study results, research has shown that organizational culture may be an important factor influencing performance in the health services field broadly (Argote, 1989; Gerowitz, 1998; Gerowitz et al., 1996; Hearld, 2008; IOM, 2001; Jackson, 1997; Scott et. al, 2003a, 2003b, 2003c) and in medical groups specifically (Kaissi et al., 2004; Kaissi et al., 2007; Kralewski et

al., 2005). For example, approaches for implementing evidenced-based care management practices have been tied to financial incentives and the development of nurturing of an organizational culture that promotes and reinforces the use of such practices (Shortell et. al., 2001). Studies have suggested that individuals in cultures that focus on organizational learning are more likely to be in synchrony with practice systems thinking (Kotter & Heskett, 1992) and those organizations are more likely to implement more successful Total Quality Management (TQM)/Continuous Quality Improvement (CQI) programs (Rondeau & Wagar, 2002). Qualitative in-depth physician interview results from the National Study on Provider Organizations and the Management of Chronic Illness (NSPO) showed that strong leadership and an organizational culture where quality is valued were consistently identified as factors facilitating the adoption of care management processes for chronic care improvement (Bodenheimer et al., 2004; Rundall et al., 2002). Having a quality-centered culture was found to be a factor in differentiating high performing versus low performing medical groups (Shortell et al., 2005). Bodenheimer and colleagues (2004) found that an organizational culture valuing quality was mentioned most frequently by personnel as facilitators to CMP use. Also, cultures that focus on teamwork have been found to be associated with greater implementation of CQI practices and achieve higher functional health status in patients with chronic conditions (Shortell, Jones & Rademaker, 2000; Shortell, O'Brien & Carman, 1995).

In addition, research has been done to describe individual medical group culture and examine the degree to which it varies between practices. Curoe, Kralewski and Kaissi (2003) found that group practices do indeed differ by types of culture, and the

characteristics they exhibit vary as predicted by organizational theory (e.g., contingency theory). For example, group practice size and degree of complexity affect the structure and the way that the practice functions. Related specifically to the study of office practice culture and its relationship to quality programs developed by the practices in 88 clinic sites in Minnesota, Kaissi et al.(2004) found that: practices that had a strong information culture favored programs that provide data and information technology to enhance their practices, those with a quality-centered culture preferred patient experience of care surveys in contrast to more business-oriented practices that relied more on benchmarking and physician profiling. Practices with high collegiality preferred informal peer review rather than more structured programs and lastly, practices that were oriented more toward autonomy were not associated with any of the quality of care programs evaluated in the study.

## Gaps in Knowledge

Studies have been done related to practice systems and quality of care and organizational culture and quality of care, though a gap in knowledge still remains related directly to specific cultural attributes and practice systems present in medical office practices. Table 1 attempts to depict where gaps still exist. It displays the following for each study related to the relationship between organizational culture and systems of care within medical office practices: the intent of each study, the results, conclusions, and any limitations and/or gaps that may still remain related to the hypotheses that have been postulated.

As demonstrated by the information presented within the table, in general very few studies have been done related to the examination of organizational culture and the use of practice systems in medical office practices, and gaps in knowledge still remain. Given this, the door seems open to continue to pursue further exploration of this area of study. This will serve to be important in gaining additional insight into characteristics of ambulatory care office practices that may influence the use of office practice systems for quality of care improvement.

## Chapter Summary

Studies have shown that quality of care in the United States is lacking. Deficiencies within medical office practices have been pointed to as an essential area of focus as it is the setting most often used by patients to access both primary and secondary care. An emphasis has been placed not only on needing to improve the care within practices but also to improve the organizations that provide that care as well.

Although there has been an increased focus on examining the relationship between organizational factors and quality of care, there has been no clear consensus with regard to results, and there is much more work to be done in the medical group setting.

Table 1. Gaps in Knowledge: Organizational Culture and Systems of Care in Medical Office Practices

| Study | Intent | Results | Conclusions | Limitations |
|---|---|---|---|---|
| Shortell et al., 2001 | Uses competing values framework to assess association between culture and use of evidence-based CMPs in 56 medical groups affiliated with 15 integrated health systems across U.S. | Overall, no association found between aspects of culture and CMP use. Positive association between patient-centered culture in combination with different types of compensation incentives and greater CMP use. | Medical groups lacked a coherent culture and sense of identity as a "group/team" which may have contributed to the lack of association found. | Oversampling of large and multispecialty groups as compared to U.S. Medical groups rather than clinics/practices studied. Limited set of CMPs evaluated. |
| Kaissi et al., 2004 | Assesses the influence of culture on CMPs in 88 practices providing services for Blue Cross Blue Shield of MN. | Information emphasis associated with EMRs, computerized drug information, profiling practice patterns, and guidelines. Quality emphasis associated with patient surveys. Autonomy negatively associated with all quality programs. Collegiality negatively associated with drug information programs, and conducting patient surveys, while positively associated with EMRs, benchmarking, profiling, and guidelines. Trust negatively associated with computerized drug information. | Culture influences types of quality programs implemented and the type of quality programs differ according to culture. Administrators should consider culture when implementing quality of care programs. | No comparative data available for clinics insured by others. Only physicians surveyed about culture whereas only administrators surveyed about CMPs. A limited set of CMPs evaluated. |

Table 1. Continued.

| | | | | |
|---|---|---|---|---|
| Kralewski et al., 2005 | Assesses the influence of practice structure and culture on prescription error rates in 78 medical office practices in the upper Midwest as part of Care Plus Managed Care. | Culture and structure influence prescription drug error rates. Lower error rates associated with cohesive cultures, autonomy, and individuality. | Structure and culture influence prescription drug error rates through use of case managers and improvement of drug prescribing patterns. | No comparative data available for clinics who may be insured by others. Only physicians surveyed about culture, only administrators surveyed about CMPs. A limited set of CMPs evaluated. |
| Kaissi et al., 2007 | Assesses effects of the fit of culture and structure on medical errors in 78 practices providing services for Blue Cross Blue Shield of MN. | Benchmarking and guideline use associated with decreased error rates in practices that encourage quality emphasis and collegiality. | Interaction between certain cultural and structural dimensions can help explain relationships between culture, structure and medication errors. Organizational structure may not act alone in terms of improving quality of care, but rather in conjunction with organization culture. | No comparative data available for clinics who may be insured by others. Only physicians surveyed about culture, only administrators surveyed about CMPs. A limited set CMPs evaluated. |

This may be due in part to the levels at which the studies have been conducted and the variables chosen to represent the organizational characteristic constructs. In general, most of this specific research has been done at the hospital level rather than focusing on ambulatory care.

With regard to the few studies that have been done within medical offices, innovative clinical practice systems have been shown to improve quality of care for patients with preventive or chronic care needs. The question remains as to what might influence their existence. Organizational culture has been studied extensively in the business literature as a malleable factor related to performance and has recently become an area of interest for health care arena as well. There remain gaps in knowledge regarding the link between culture and systems of care (Table 1 shows only four directly related studies that have been identified), which this study may help to shed light upon.

# CHAPTER 3 – THEORETICAL FRAMEWORK

## Introduction

This chapter presents a theoretical framework to help explain the relationships between specific cultural characteristics and systems of care within medical practices and to aid in the generation of study hypotheses. Organizational culture theory has been chosen as the primary theory and is examined to help relate micro-level interactions or relationships of individuals within medical practices to macro-level patterns of implementing clinical process innovation or systems of care. Components of social network theory and organizational learning theory are also used to help explain the mechanisms by which these relationships may work. In conjunction these theories may provide a plausible framework to help explain the relationship between the specific culture characteristics examined and the implementation of systems to improve quality of care within the practices.

This chapter presents a general overview of the use of theory in health care research, a review of the history and applications of organizational culture theory in related research and the development and presentation of study hypotheses. Of note, given the use of secondary data and the existence of previously defined measures, the theoretical framework described will be used to help develop the hypotheses for the study, but a traditional empirical study of these theories will not be possible.

## Background

Bacharach (1989) defines theory as "a system of constructs and variables in which the constructs are related to each other by propositions and the variables are related to each other by hypotheses, with the whole system bounded by the theorist's assumptions" (p. 498). He relays that the value of theory is to enable the organization and communication of rather intangible concepts in a more simple and clear-cut manner that ultimately facilitates testing of the relationships between constructs and progression of the field.

In particular, organizational theory consists of a framework for the examination of how things work within organizations, and related to health care field specifically, can be used to gain insight into the structure, functioning and performance of health care organizations (Shortell & Kaluzny, 2006). Organizational theory provides a way to understand how and why organizations respond to their surroundings in the way they do (Mick & Wyttenback, 2003). In general, a review of the literature shows that studies examining structural characteristics in health care have been lacking when it comes to providing a solid theoretical foundation, and recommendations have been set forth to stress the importance and need for this type of foundation to guide future work (Hearld et al., 2008).

## Organizational Culture Theory

Organizational culture theory developed from several schools of thought including organizational psychology, social psychology, and social anthropology (Scott et al., 2003b) and has been applied to organizational studies since the 1980s. The

influence from different disciplines has generated competing models and frameworks where from one extreme, organizations have been defined as cultures themselves and to another extreme, culture has been defined as a quality an organization possesses. Although there have been several models developed, general movement has been toward the functionalist view of organizational culture as outlined by Edgar Schein (1985):

> Organizational culture is the pattern of shared basic assumptions-invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration-that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 9).

In his model, Schein (1985) describes a framework for organizational culture where shared values and beliefs of an organization that are deeply embedded within the organization help to develop its character and norms (Schein, 1990; Schneider et al., 1992). The model includes three levels: Level 1 is labeled artifacts and includes observable patterns of behavior such as rituals, dress codes, and ceremonies; level 2 is labeled beliefs and values, and can be used as justification for behavior patterns; and Level 3 is labeled assumptions and is mostly related to unconscious values and expectations. In general, organizational culture theory stresses cultural unity through the creation of common norms, shared social identity and standardizing group identity (Hogg & Adams, 1988; Goffman, 1959; Levi, 2001), though the total culture of an organization may reflect a blend of subcultures or dominance by one or more influential subcultures (Schein, 1990) as previously suggested.

## Application of Organizational Culture Theory

Long before much of the literature on organizational culture theory was written, the notion of how well an organization performs as a function of its culture can be followed back as far as the Hawthorne studies conducted in the 1920s and 30s (Roethlisberger & Dixon, 1938). In these studies, changes made to the workplace conditions and environment resulted in employee performance changes. Since the 1980s, when writings on organizational culture theory were most prominent, a majority of the studies in the business literature focused on organizational resistance to change in strategy and structure (Hinings, et al., 1996). Organizational culture theory has also provided a framework for focusing attention on the relationship of culture to organizational performance in terms of productivity. The work of Ouchi (1980) proposed that corporate culture was the main difference between manufacturing firms in the United States and in Japan.

With respect to understanding this relationship between culture and performance in health care, there is evidence to suggest culture may be a relevant factor in achieving higher quality of care, "yet articulating the nature of that relationship has proven difficult" (Scott, Mannion, Marshall & Davies, 2003c) (p. 105). In general there has been considerable variation between studies in terms of design, definitions of variables for culture and performance, and study setting (Scott et al., 2003c). A majority of studies have taken place using the hospital as the unit of analysis, where results have been mixed.

Medical practice studies, which have been fewer in number, have shown more consistent results.

## Incorporating Theory into Research

The incorporation of theory into research is important not only for creating a framework for testing relationships between constructs and between variables but also for gathering knowledge in order to move the discipline forward. Although incorporation of theory has been stressed as important, a review of the literature has shown that the use of theory in health services research overall has been limited (Hearld et al., 2008).

Research recommendations from Hearld et al. (2008) directed at the incorporation of theory into health services research, and in particular the study of structure and process as related to quality of care, have stressed the need for theories to link the components of the structure-process-outcome triad. The authors propose that multiple theories that are more dynamic in nature than what has previously been used might do a better job in helping to explain these types of complex relationships and push researchers to ask more dynamic questions when linking together components of the Donabedian model. In the book Advances in Health Care Organization Theory (Mick & Wyttenback, 2003), a collection of writings for the advancement of organization theory, many of the authors use more than one theory and a matrix of factors as the framework to support their hypotheses related to complex relationships. For example, Luke and Walston (2003) explain that one framework is not robust enough to explain the behaviors of organizations, especially in health care, so they use four.

The call for theory to provide the necessary framework for health services research and the recent direction of integrating multiple theories supports the exploration of additional theories as related to this study. In particular, although organizational culture theory has been identified as the primary theory, it may be beneficial to incorporate one or more additional related theories to help provide a probable explanation for or mechanism by which the relationship between the constructs and more specifically the variables, may occur. In the text that follows, both social network theory and organizational learning theory will be described and examples of previous applications are given in an effort to provide context and support for their incorporation into the conceptual framework that follows.

### *Social Network Theory*

A social network refers to a mapping or description of the relationship or connection between people or groups. Social network theory proposes that specific attributes of individuals are less important than their relationships and ties with others. The theory originated, in part, through the work of three authors, Milgram (1967) who wrote about average path length for social networks of people (associated with the six degrees of separation concept), Granovetter (1973, 1983) who focused on the strength and weakness of ties, and Barnes (1954) who looked at social networks. Social network theory has been used by social scientists to explain a wide variety of social phenomena, but network theory in and of itself has also been used by physical scientists to help explain relationships in biology and physics (Borgatti, Mehra, Brass & Labianca, 2009).

Social network research has focused primarily on the consequences of networks, where position in the network is related to opportunities and constraints and ultimately on outcomes (Borgatti, et al., 2009). This idea has been applied at both the micro level and macro level, used to explain relationships between individuals, groups and networks and their impact on organizational response. In general, two main categories of outcomes have been focused on: homogeneity and performance (Borgatti et al., 2009). Research on homogeneity, for example, has focused on similarities between network actors' behavior or structure whereas research on performance has focused on rate of innovation adoption (Borgatti et al., 2009).

Analysis of social networks has also been suggested as a tool for linking micro and macro levels of sociological theory together (Granovetter, 1973). It provides a way to think about how interactions within small groups may aggregate to create patterns on a larger scale. These networks provide ways for organizations and individuals to communicate and share information, diffuse innovations, deter competition and cooperate in setting policies and procedures. For example, social network theory and the concept of embeddedness have been used as a framework to help understand innovation diffusion and innovation output at an organizational level (Burns & Wholey, 1993; Galaskiewicz & Wasserman, 1989; Shan, Walker, & Kogut, 1994). Embeddedness has been associated with a better opportunity for open communication and knowledge transfer, joint problem solving and sharing of resources (Gulati, 1995; Uzzi, 1997). Strong ties have been associated with reinforcement of communication and knowledge transfer (Granovetter,

1973) and weak ties have been associated with the provision of new information and resources, beyond that of the immediate set of close ties (Granovetter, 1983)

### *Organizational Learning Theory*

Organizational learning theory is an area of knowledge that focuses on understanding the ways in which organizations learn and adapt. Argyris and Schon (1978) were originators of models related to this theory. A learning organization is generally one that is "skilled at creating, acquiring and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" (Garvin, 1993) (p. 80). This can occur through adaptive learning processes where behavior and current processes are adjusted in response to events or through generative learning where changing the underlying structure of the system is the focus (Weiner et al., 2006). Organizations that are apt at learning are generally characterized by those that are willing to 1) push the boundaries and experiment, 2) focus on continuously improving, 3) be flexible and adaptive, 4) put an emphasis on measuring and monitoring and, 5) make a real investment in the process as a whole (Argyris, 1999).

Related specifically to health care, continuous quality improvement (CQI) is a model that has developed from organizational learning theory, and entails "structured organizational processes for involving personnel in planning and executing a continuous flow of improvements to provide quality health care that meets or exceeds expectations" (McLaughlin & Kaluzny, 2005) (p. 3). In general, organizational learning theory proposes that the better an organization is at learning, the better and more likely it will be

at detecting and correcting errors, which will ultimately result in the organization being more innovative.

The literature surrounding organizational learning has focused on two main themes: that which relates to a more practical and prescriptive idea of 'the learning organization' as focused on by consultants and practitioners and that which relates to the more academic or scholarly concept of 'organizational learning' (Argyris, 1999). Although different, they do converge around some main ideas including the attributes that make organizational learning positive in nature, the threats to its productivity and overcoming potential barriers to success.

In terms of applying the theory, organizational learning has been used to explain whether specific cultural attributes are in place to achieve desired organizational performance. More specifically it has been used to help explain why certain Total Quality Management (TQM)/Continuous Quality Improvement (CQI) programs have been successful or unsuccessful in achieving intended goals (Rondeau & Wagar, 2002). It has also been used to support technical innovation in treating disease (Van de Ven & Polley, 1992) and to explain an organization's response to a changing competitive environment (Burgleman, 1994). Studies have also suggested that individuals in cultures that focus on organizational learning are more likely to be in line with practice systems thinking (Kotter & Heskett, 1992)

## Theoretical Assumptions

Related to this study, certain theoretical assumptions and proposed relationships between key constructs can be derived from the theories. Hypotheses about the impact of

culture on organizational processes in medical office practices can then be developed from these assumptions and are described in a later section.

### *Organizational Culture Theory*

Based on a review of the literature including both the original organizational culture theoretical writings and the writings of those who incorporated this theory into health care research, Scott et al. (2003b) summarized assumptions made by those who support cultural change to improve health care processes. These assumptions include the following:

1. Health care organizations possess distinct cultures that are able to influence performance and quality;
2. Although difficult, culture is ultimately manageable and amenable to change;
3. Factors can be identified that relate directly to improved or failed performance and strategies for cultural change can be designed around them;
4. Benefits from change should outweigh any negative consequences.

### *Social Network Theory*

Theoretical assumptions related to social network theory are as follows:

1. Attributes of individuals are less important than their relationships and ties with others. All behavior is embedded in these types of social relationships and diffusion of information and innovations for example would be related to the strength of ties (Granovetter, 1973, 1983). In terms of innovation diffusion, the theory suggests that weak ties may be very important in terms of initially bringing

new ideas to the group and strong ties would be important in facilitating the successful adoption of the new ideas or innovation.

2. The more embedded or dense, stronger or direct the ties are between individuals within the organization, the more likely individuals are to communicate and share information, diffuse innovations, deter competition and cooperate in setting policies and procedures.

### *Organizational Learning Theory*

Theoretical assumptions related to organizational learning theory are as follows:

1. A learning organization is generally one that is "skilled at creating, acquiring and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" (Garvin, 1993) (p. 80).

2. The better an organization is at learning, the better and more likely it will be at detecting and correcting errors, which will ultimately result in the organization being more innovative.

## Conceptual Framework

The overarching conceptual framework for this study is summarized in Figure 1. It depicts the relationship between organizational culture and organizational behavior resulting in the implementation of innovative strategies. It also incorporates both social network theory (diagram 1) and organizational learning theory (diagram 2) to help provide a probable explanation for or mechanism by which the relationship between the constructs may occur.

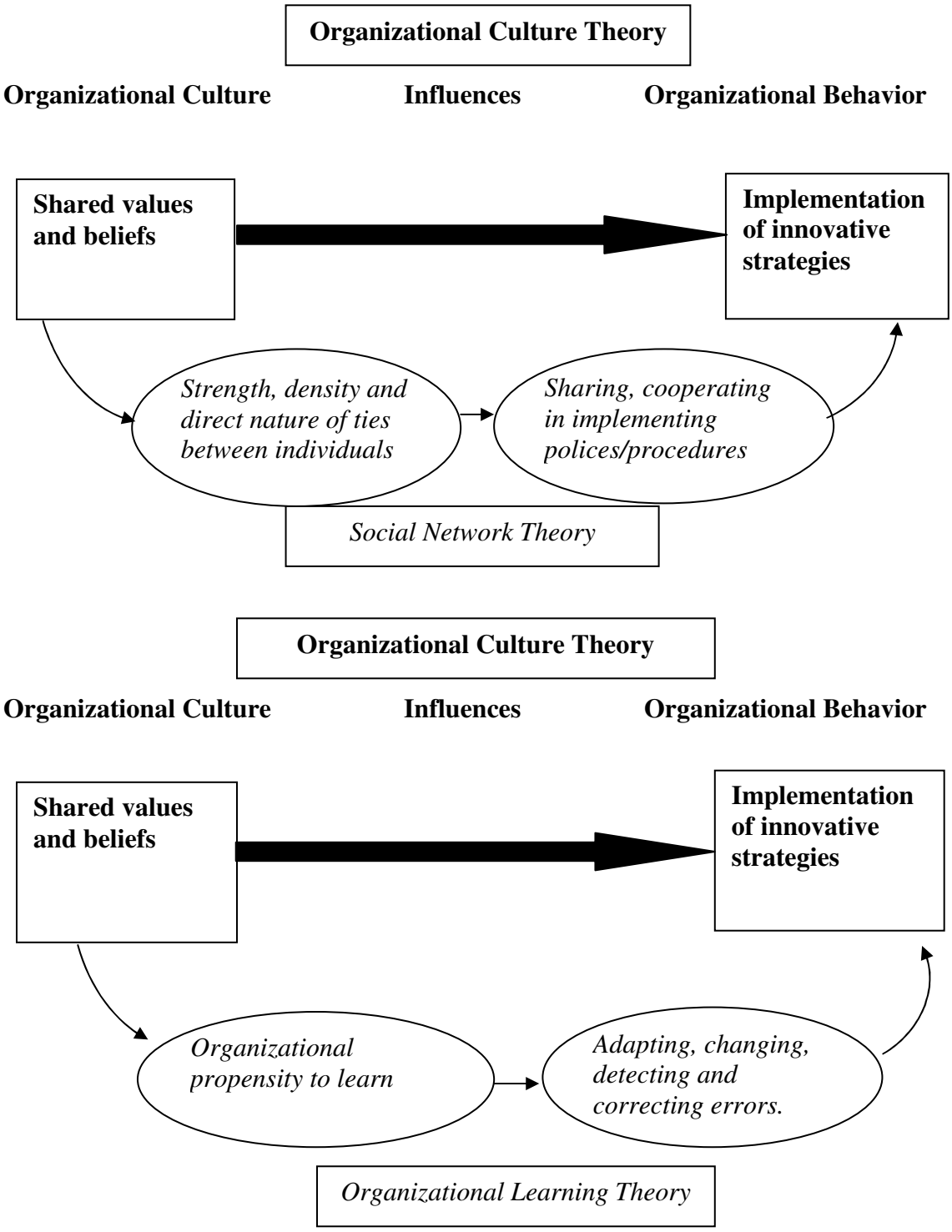


Figure 1: Framework for Organizational Culture's Effect on Organizational Behavior

The overall figure gives a high level depiction of the framework for the study. The first diagram within Figure 1 illustrates that primarily, organizational culture dimensions have an influence on behavior.

As a probable explanation for this relationship, the diagram further shows that in the context of social network theory, shared values and beliefs of an organization may influence the micro-level ties between individuals in organization, which may in turn influence how well individuals communicate and share thus providing the opportunity for acceptance of policies and procedures and diffusion of innovations. The second diagram within Figure 1 illustrates in a similar fashion that organizational culture dimensions have an influence on behavior. As a probable explanation for this relationship, the diagram further shows that in the context of organizational learning theory shared values and beliefs within an organization may influence a strong propensity to learn, making it more likely to adapt and change, detect and correct errors and ultimately may be more innovative.

The higher level ideas were then made more specific in relation to this study. Figure 2 depicts the relationships between the **variables** in the study in the context of the theories. The first diagram in Figure 2 primarily depicts the relationship between the organizational culture variables of collegiality and autonomy and their influence on the implementation of practice systems of care. As a probable explanation for this relationship, the diagram further shows that in the context of social network theory, collegiality and autonomy may influence ties between individuals within organizations which may influence or affect how well individuals communicate, which may ultimately

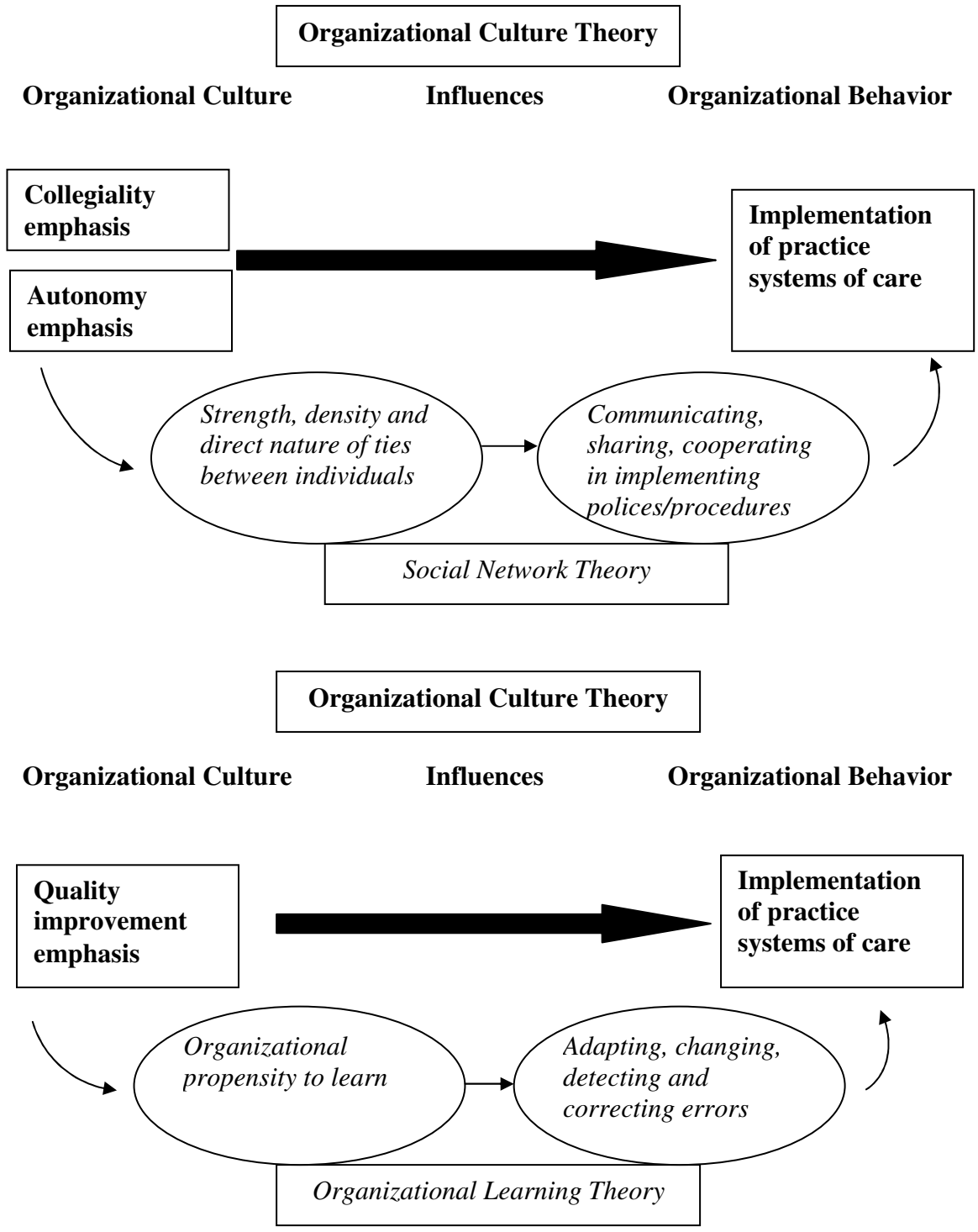


Figure 2: Framework for Collegiality, Autonomy and Quality Emphasis' Effect on Implementation of Practice Systems

influence, the acceptance of policies and procedures and diffusion of innovations such as implementation of practice systems of care. As will be detailed out in the hypotheses section, collegiality and autonomy are proposed to influence the diffusion of innovations and implementation of practice systems differently.

The second diagram of Figure 2 shows that an emphasis on quality within the practice is likely to influence the implementation of practice systems. As a probable explanation for this relationship, the diagram further shows that in the context of organizational learning theory, organizations with an emphasis on quality may be more likely to adapt and change, detect and correct errors, innovate and be more willing to adopt practice systems of care.

## Study Hypotheses

As illustrated in the conceptual framework as laid out above, this study uses the constructs of organizational culture theory to better understand the rationale for the relationships between the variables. Examining this theory in the context of social network theory and organizational learning theory may provide a plausible framework for helping to explain the relationship between the specific culture characteristics examined and the implementation of systems to improve quality of care within the practices. Hypotheses developed from the conceptual model are detailed below.

### *Hypotheses Developed from Organizational Culture Theory & Social Network Theory*

The hypotheses laid out below have been developed from organizational culture theory in the context of social network theory in order to help explain the relationships

between organizational culture and organizational behavior within medical office practices.

Organizational culture theory has been used in health care settings to explain relationships between held beliefs/values/norms and organizational behavior/performance. Social network theory has been used to explain relationships between networks of individuals, their ties and organizational diffusion of innovations (Burns & Wholey, 1993; Galaskiewicz &Wasserman, 1989).

Related to organizational culture theory, previous research has shown that innovations in health care increasingly require health care professionals collaboratively learning to use them (Adler et al., 2003), but at times the hierarchy within health care organizations may stifle collaborative learning necessary for implementation success (Nembhard & Edmondson, 2006). Collaborative learning is a process by which individuals jointly analyze, openly discuss, sharing decision-making, and coordinate testing. Stronger group cultures have been associated with shared decision making, and a supportive learning environment leading to better outcomes (Davies, Mannion, Jacobs, Powell & Marshall, 2007; Shortell, Zimmerman, Roussseau, Gillies, Wagner, Draper, Knaus & Duffy, 1994; Zazzali, Alexander, Shortell, & Burns, 2007).

Related to social network theory, previous studies have shown that ties between individuals have been linked to innovation (Shan et al., 1994) with the assimilation of knowledge related to sharing resources and solving of problems (Gulati, 1995; Uzzi, 1997). As knowledge flows along a network path and as the nodes are bound together,

they can communicate and coordinate together effectively to achieve certain outcomes (Borgatti et al., 2009).

Based on this information, in the case of the first cultural dimension, collegiality, in an environment where there is a close collegial environment among physicians, including informal consulting, sharing of clinical information, a strong sense of belonging to a group, a strong sense of responsibility to help another physician with a personal problem and the existence of candid and open communication between physicians and nurses, there is more likely to be a greater number of ties or linkages between individuals.

In the case of the second cultural dimension, autonomy, in an environment where there is a an emphasis on physician individuality, where each physician has the right to practice according to his or her own style, where each clinician feels autonomous but practices in the same organization for support services and where there is a great deal of tolerance of a physician's idiosyncratic patient care practices, there is less likely to be a significant number of ties or linkages between individuals. Based upon these assumptions one could hypothesize the following:

**Hypothesis 1: An emphasis of collegiality will be positively associated with innovative clinical practice systems use within medical office practices.**

**Hypothesis 2: An emphasis of autonomy will be negatively associated with innovative clinical practice systems use within medical office practices.**

These hypotheses are supported both by theory and by previous research. In a research study conducted by Kaissi et al. (2004), which assessed the influence of organizational culture on quality of care programs in medical group practices, practices

focusing on autonomy were negatively associated with all quality of care programs studied, while practices with high collegiality relied on peer review for quality assurance. A study conducted by Kaissi et al. (2007) to assess the effects of organizational culture and organizational structure and their fit with medication errors in group practice also showed that the use of benchmarking and practice guidelines was associated with decreased error rates in practices that encourage collegiality. Interestingly, in a study to determine benefits and barriers of physicians practicing within groups, survey results revealed that need for autonomy and difficulty in cooperating with other physicians was noted most frequently as the barrier (Casalino, Devers, Lake, Reed, Stoddard, 2003).

*Hypothesis Developed from Organizational Culture & Organizational Learning Theory*

The hypothesis laid out below has been developed from organizational culture theory in the context of organizational learning theory in order to help explain the relationships between organizational culture and organizational behavior within medical office practices.

As previously stated, organizational culture theory has been used in health care settings to explain relationships between held beliefs/values/norms and organizational behavior/performance. Organizational learning theory has been used to explain relationships between an organization's penchant for learning and its implementation of innovations.

Related to organizational culture theory, certain authors have suggested that when performance measurement and control systems are underdeveloped and when performance is not rewarded, there is neither the structure nor the incentive for

innovation implementation to be successful. This lack of emphasis on quality improvement may stem from the belief that when staff perception of quality is high, it does not need a separate focus.

Related to organizational learning theory, a learning organization is thought to be one that is "generally skilled at creating, acquiring and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights" (Garvin, 1993) (p. 80). Organizations that are apt at learning are generally characterized by those that are willing to 1) push the boundaries and experiment, 2) focus on continuously improving, 3) be flexible and adaptive, 4) put an emphasis on measuring and monitoring and, 5) make a real investment in the process as a whole (Argyris, 1999). In general, organizational learning theory proposes that the better an organization is at learning, the better and more likely it will be at detecting and correcting errors, which will ultimately result in the organization being more innovative. In a study by Shortell and colleagues (2005) which assessed various dimensions of medical group performance, a significant positive relationship (although small) was found between a culture that favors organizational learning and results on quality of care performance measures.

Based on this information, in the case of the third cultural dimension, quality emphasis, in an environment where quality of care is goal number one, where patient satisfaction is emphasized, where there is an open discussion of clinical failures, where quality of the physician's work is closely monitored, where internal reporting of adverse events is encouraged and where physicians who develop inappropriate patient care practices will be talked to, then related to organizational learning theory, the organization

is more likely to be skilled at acquiring new knowledge and at changing its behavior to reflect best practices. In the Shortell et al. (2005) study on high performing medical groups as referenced above, having a quality-centered culture was a consistent and strong differentiator of high performing versus low performing medical groups. Based upon these assumptions, one could hypothesize the following:

**Hypothesis 3: An emphasis of quality will be positively associated with innovative clinical practice systems use within medical office practices.**

This hypothesis is supported by theory and also by previous research. Organizational learning theory has been used to explain whether specific cultural attributes are in place to achieve desired organizational performance. Within the business literature Dension & Mishra (1995) showed that those organizations characterized by adaptability and flexibility are in turn more open and responsive, and ultimately achieve better outcomes of growth, quality and overall performance (Denison & Mishra, 1995).

In the health care literature, the theory has been used to help explain why certain Total Quality Management (TQM)/Continuous Quality Improvement (CQI) programs have been successful or unsuccessful in achieving intended goals (Rondeau & Wagar, 2002). Rondeau & Wagar (2002) suggest that, "people in learning organizations are more likely to understand practice systems thinking" (p. 19) and "cultural values consistent with organizational learning may be a necessary precondition for TQM/CQI implementation and enhanced organizational performance" (p. 22). Their study conducted in Canadian long term care facilities showed that when a strong corporate culture stressing organizational learning was lacking, few enhancements for positively changing organizational performance through TQM/CQI processes were shown.

Certain studies have also shown that developmentally oriented organizations are able to achieve better outcomes. In a study conducted by Davies et al. (2007) that examined the relationship between team culture and hospital performance, the hospitals that were developmentally oriented (focusing on growth, innovation and entrepreneurship), had higher amounts of research activity, better data quality and higher quality of care star ratings.

Studies in medical office practices have shown similar types of results. In a study conducted by Kaissi et al. (2004) to assess the influence of organizational culture on quality of care programs in medical office practices, the authors found that in general, culture influences types of quality programs implemented and the type of quality programs differ according to their cultures. In particular, the cultural characteristic, quality emphasis, was significantly positively associated with conducting of patient surveys within these practices. In a related study conducted in medical office practices looking at the relationship between the effects of the fit of organizational culture and structure on medical errors, Kaissi and colleagues (2007) found that organizational structure may not act alone in terms of improving quality of care, but rather in conjunction with organization culture. In particular, benchmarking and guideline use was associated with decreased error rates in practices that encouraged quality emphasis as a culture trait.

## Chapter Summary

This chapter has been used to develop a theoretical framework to help explain the relationships between specific cultural characteristics and systems of care within medical

practices and to aid in the generation of study hypotheses. Organizational culture theory was examined to help relate micro-level interactions or relationships of individuals within medical practices to macro-level patterns of implementing systems of care. Components of social network theory and organizational learning theory were used to help explain the mechanisms by which these relationships may work. In particular, social network theory relates the effect of relationships on organizational response, whereas organizational learning theory relates the effect of learning and adaption on organizational response.

The chapter presents a general overview of the use of theory in health care research, a review of the applications of each of the chosen theories in related research and the development and presentation of study hypotheses related to this study.

Table 2 summarizes the hypotheses for the research study based on these theories. For each hypothesis it shows the independent and dependent variables and their predicted relationship.

Table 2. Summary of Study Hypotheses and Associated Theories

| Construct | Association with Implementation of Practice Systems |
|---|---|
| **Organizational Culture Theory & Social Network Theory** | |
| Collegiality Emphasis | + |
| Autonomy Emphasis | - |
| **Organizational Culture Theory & Organizational Learning Theory** | |
| Quality Emphasis | + |

# CHAPTER 4 - METHODOLOGY

## Introduction

This chapter outlines the methodology for the study including the details behind the research design and analytical plan for the associated research questions and hypotheses. A review of the study's data sources, survey development, study sample, variables, measures, validity and reliability are covered. The study was submitted to the Institutional Review Board at Virginia Commonwealth University, Office of Research Subject and Protection and was approved by exempt review. A summary of the study's objectives, research questions and hypotheses are highlighted in Table 3.

## Research Design

The study was implemented to determine whether organizational culture as defined by the specific cultural attributes of collegiality, quality emphasis and autonomy is associated with practice systems use. The research plan for this study is a descriptive, quantitative, cross-sectional, correlational design. Secondary self-report survey data from medical office practice respondents was utilized. An evaluation of evidence relevant to the research questions was considered in the context of organizational culture theory.

The study is considered to be cross-sectional and non-experimental because data were collected at one point in time rather than at multiple times over an extended period and there was no manipulation of the independent variable (Polit & Beck, 2004). As

Table 3. Summary of Study Objectives, Research Questions and Hypotheses

| **Objectives** | **Research Questions** | **Hypotheses** |
|---|---|---|
| To characterize the degree of variation in medical practice respondents' assessment of culture and systems use. | What is the degree of variation in medical practice respondents' ratings of culture and systems use? | Variation will exist across respondent ratings of culture and of systems use. |
| To understand whether any of the survey questions representing the culture constructs and whether the survey questions representing the domains of practice systems are highly correlated and can be combined into a more reduced set of variables for each construct. | Are survey questions representing the culture constructs related? Are the survey questions representing the practice systems related? Can greater parsimony be achieved in measures of medical practice culture and measures of practice systems? | Survey questions representing the culture constructs are related and can more precisely describe practice culture.<br><br>Survey questions representing the practice systems constructs are related and can more precisely describe practice systems use. |
| To utilize organizational culture theory as a framework to test whether there is a relationship between medical practice culture and medical practice systems use. | Is medical practice culture associated with medical practice systems use? | An emphasis of collegiality will be positively associated with innovative clinical practice systems use.<br><br>Quality emphasis will be positively associated with innovative clinical practice systems use.<br><br>An emphasis of autonomy will be negatively associated with innovative clinical practice systems use. |

mentioned, data for the study were already collected for other purposes; this is a secondary data analysis. The study is considered to be a descriptive correlational study because the strength and direction of any relationships between variables was examined (Burns & Grove, 2004; Polit & Beck). The study is considered to be quantitative because numerical data have been collected and was analyzed.

Although descriptive correlational research designs lie at the opposite end of the design spectrum from experimental designs in terms of rigor and ability to reveal causal relationships, an experimental design is not a practical approach for examining the proposed relationships in this study (Polit & Beck, 2004). Not only are experimental designs burdensome in terms of resources (i.e., time and cost), but they are generally better suited for hypothesis testing through controlled interventions rather than validation of the suitability of a conceptual framework such as organizational culture theory. As described in the gaps in knowledge section, given the few studies that have explored this topic, the subject area could benefit from an additional descriptive cross-sectional approach to describe the variables and relationships among them. In addition, given that the independent variables are organizational culture characteristics, and organizational culture grows and develops over an extended period of time, it would be a very difficult concept to manipulate in an experimental study.

## Research Design Validity

It is important that the research design of a study does, "the best possible job of providing trustworthy answers to the research questions" (Polit & Beck, 2004) (p. 209). To understand whether this is the case, aspects of a study's internal validity, construct

validity and external validity can be examined. Construct validity, which focuses on the validity of variable measurement, is discussed further in the Measurement Validity and Reliability section below.

Internal validity is related to whether the design decisions chosen for a study promote detection of true relationships. Correlational studies are particularly susceptible to internal validity threats (Polit & Beck, 2004). Issues such as low statistical power, inadequate precision, unreliable implementation of a treatment in an experimental study, selection, testing and endogeneity of variables can all be factors (Polit & Beck, 2004). In terms of this cross-sectional correlational study, one important way to address precision is through control of extraneous variables. It is important to isolate the portion of the variation in practice systems implementation attributable to culture. This will be done by controlling for other medical office practice characteristics that may also be related to the implementation of practice systems. Statistical power will be discussed in more detail in the Power Analysis section below.

The threat of selection is related to differences that exist between groups. Related to the this study, since individuals were not randomly assigned to groups, but rather preexist in the medical office practices where they work, there may be some subtle differences between them that may have an impact on the relationship seen between the variables. One way to mitigate the threat in this study is to control for other medical office practice characteristics that may also be related to the implementation of practice systems. Selection bias may also exist related to the medical groups and practices associated with those groups who chose to participate in the study as compared to those

who declined participation. They may be different on some unmeasured characteristics, which is a possible limitation of the study.

Threats to internal validity from testing result when the effects of taking a pretest have an effect on subsequent results for a posttest. In the case of this study, medical groups that participated in any pre-testing of the survey and/or audit of results were not included among the groups for this study.

The threat of potential endogeneity of variables also exists. That is, within a cross-sectional study it is difficult to determine whether the independent variable is influencing the dependent variable, or whether the dependent variable is influencing the independent variable. In the case of this study, this threat can be minimized through specific analytic techniques (discussed further under the Analysis Plan section below) and through the use of well-established theories that explain the relationship between organizational culture having an influence on performance.

The threat of history is when certain external events take place at the same time as the independent variable and can impact the dependent variables. In terms of this study, since groups in Minnesota were exposed to quality improvement efforts, their awareness of systems of care may have affected the adoption of these systems and the accuracy of their reporting of them. Though it is not clear whether this would have a positive or negative effect on results, all practices were exposed to the quality improvement efforts, which may help to equalize the effect across practices. This history however, does not threaten validity. It may influence the independent or dependent variables, but not the

relationship between them. No other external events are believed to have influenced the practices.

External validity refers to the ability to generalize the results of a particular study to other settings given the study sample and environment are representative of other environments (Polit & Beck, 2004). With regard to this study, the data are from medical practices in the upper Midwest where there are a larger proportion of physicians practicing in medical groups than throughout the rest of the country. Given this, it will be important to interpret results from the study cautiously. Results may be generalizable to a similar type of environment. Also, since the practice of medicine is growing in the direction of the group model, it is reasonable to think that the results may have implications nationally.

## Data Sources

This study uses secondary data sources to determine whether organizational culture as defined by the specific cultural attributes of collegiality, quality emphasis and autonomy are associated with office practice systems use. The existing database contains de-identified self-reported survey results from 300 medical office practice site respondents across 42 practices, collected in 2005. The database also contains descriptive information about the practices and the respondents.

## Secondary Data

Given the intricacies of health care organizations and the important role they play in affecting care, there has been an increased interest in systems measurement by stakeholders. Although valid and reliable tools for systems measurement are needed, few

exist. Given this need, the National Committee for Quality Assurance (NCQA) developed and tested a self-report survey tool to assess the presence and function of clinical practice systems called the Physician Practice Connections Readiness Survey (PPC-RS) (Scholle et al., 2008; Solberg et al., 2005; Solberg et al., 2008). The survey was designed to evaluate the extent to which physician practices use information systematically to enhance quality of care for patients and was also designed to be a quality improvement tool for practices. The extent of "systemness" is determined by how well the practice is connected to specific sources of information; that is, other clinicians, new research, evidence-based clinical knowledge, and their patients' complete medical histories.

This study is an outgrowth of a previous project and primary survey development and data collection effort led by NCQA. With support from the Robert Wood Johnson Foundation (RWJ), NCQA developed a self-report survey tool (PPC-RS) to assess the presence and function of clinical practice systems in medical office practices (Scholle et al., 2008). The PPC-RS survey evaluates the extent to which physician practices use information systematically to enhance quality of care for patients. It looks at how well the practice is connected to specific sources of information such as other clinicians, new research, evidence based clinical knowledge, and their patients' complete medical histories. In addition, questions related to office practice culture characteristics of collegiality, autonomy and quality emphasis, borrowed from the work of Kralewski and colleagues and questions related to office practice staff demographics were also asked of the respondents.

Three objectives of the initial NCQA study were: 1) to document the presence and functioning of different practice systems in a small sample of medical groups in Minnesota; 2) to examine the relationship between the presence of practice systems and prior adoption of an electronic medical record (EMR) (Solberg et al., 2005); and, 3) to evaluate the accuracy of self reports from clinical personnel (Scholle et al., 2008).

This study extends this research by quantitatively examining the relationship between physician office practice culture and practice systems use, which was not previously analyzed through the data collected.

In general, this body of research is important and timely. As an updated version of the survey tool is now being used by NCQA to evaluate whether practices have the systems in place to be considered as medical homes, the environment seems ripe for further dissemination of these types of study findings. The Physician Practice Connections® – Patient-Centered Medical Home™ (PPC®-PCMH™) version of the survey is designed as standards-based tool which measures aspects of care under nine domains: access and communication, patient tracking and registry functions, care management, patient self management support, electronic prescribing, test tracking, referral tracking, performance reporting and improvement and interoperability. These domains have evolved from knowledge gained through administration of the earlier PPC-RS survey and through collaboration with the American College of Physicians (ACP), American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP) and the American Osteopathic Association (AOA). The current PPC®-PCMH™ survey does not contain questions related to organizational culture.

## Survey Development

The survey tool (included within the appendix) asked respondents to answer questions related to the use of medical office practice systems across several domains (registry, clinical information systems, systematic monitoring, clinician reminders, performance tracking and feedback, clinical quality evaluation and improvement, and care management), respondent characteristics (age, gender, discipline), and organizational culture characteristics (collegiality, autonomy and quality emphasis). In addition, researchers obtained information on medical group and practice characteristics (location, ownership, size) from the Institute for Clinical Research Systems Improvement (ICSI), a quality improvement collaborative that includes most of the medical groups and hospitals in the state. The full-length version of the survey consisted of 75 questions, while the shorter version of the survey filled out by non-physician staff consisted of 45 questions. The major difference between the full and shorter version of the survey was that the full version contained additional questions to yield more detail on the implementation of systems. The answers to the additional questions were not used in this study.

The main part of the survey tool, which consisted of the questions on systems of care, was developed through an extensive literature search to help determine which practice systems had a link to positive health outcomes and better quality of care, which processes were within the control of a physician's office and whether data could be feasibly collected. The tool was based upon prior research from the IOM (1999 & 2001), Stephen Shortell and colleagues and their work on the National Study of Physician

Organizations and the Management of Chronic Illness (NSPO) (http://nspo.berkeley.edu/), the Chronic Care Model (Wagner, 1998; Bodeneimer et al., 2002a, 2002b) and the Six Sigma process fostered by General Electric, an organizational quality system focused on reducing errors, saving dollars and satisfying customers (Pande, Neuman, Cavanagh, 2000) showing that adopting systematic processes and information technology to establish the connections, can improve quality of care. The Six Sigma method was used to identify deficiencies in systems that lead to failures in care. Interestingly, the results of the literature review and the Six Sigma process were compared by an expert panel and both resulted in similar findings on which systems of care are the ones that matter.

The survey tool was tested extensively to determine whether physicians understood the questions being asked, whether the answers to questions reflected the existence of systems of care within the practices and the actual use of systems. A third party on-site audit was used to examine self-report and use of systems within a sample of practices. Through a separate study, the tool demonstrated that the presence of practice systems overall and within specific domains was associated with high quality of care for patients with diabetes (Solberg et al., 2008).

Questions related to organizational culture characteristics were borrowed from an organizational culture survey tool developed and tested by Kralewski and colleagues specifically for physician office practices. The subset of culture characteristics chosen, including those related to collegiality, quality emphasis and autonomy, were thought to be related most closely with the uptake and use of the structural and systems components

by physicians for examination in the study. The probable link between these specific cultural attributes and structural systems has also been supported by research of others (Kaissi, Kralewski, Dowd, Heaton, 2007).

Further details on measurement validity and reliability are discussed in a separate section below.

## Survey Administration and Study Sample

NCQA partnered with the HealthPartners Research Foundation to collect data in the summer of 2005 from medical groups in Minnesota in collaboration with Institute for Clinical Research Systems Improvement (ICSI), a quality improvement collaborative that includes most of the medical groups and hospitals in the state. For the parent study, the target population was primary care medical groups, and at the time of the study, member organizations of ICSI (hospitals and med groups) included about 75% of the physicians in Minnesota (Farley et al., 2003).

Contact information was obtained for 19 of 38 medical group members of ICSI who provided primary care to adults in Minnesota in order to reach a final intended sample size of 12 medical groups. Researchers were interested in recruiting medical groups with diversity in location (urban and rural), size and comfort level with quality improvement methods (Solberg et al., 2005).

In general, no standardized definition of medical group or medical office practice exists (Casalino et al., 2003a). Related to this study, medical groups were considered to be formally organized legal entities in which physicians comprise more than one practice site in different geographic locations. Practice sites were considered to

be entities in which one or more physicians practice at a single geographic location. In general, medical groups provide benefit in terms of negotiation leverage with health plans and hospitals and gaining economies of scale in purchasing and management (Casalino et al.), while certain practice sites have been seen to remain independent in terms of their organizational culture, leadership, approach to quality of care, information technology approach and systems of care use (Kaissi et al., 2004, 2007; Kralewski et al., 2005; Shortell et al., 2005).

With respect to primary care practices in Minnesota, the sampling frame (19 groups) included a full breadth of medical group and practice site sizes, with most medical groups having more than one practice site and most practice sites consisting of more than five primary care physicians at a site. In comparison to national data, medical groups and office practices in Minnesota appear to be somewhat atypical. Survey data from research conducted by Casalino et al. (2003a) have shown that nationally almost 50% of physicians work in practices of one or two physicians and more than 80% of physicians work in practices of nine or fewer physicians. Contrary to that, primary care in Minnesota has been represented by mostly large medical groups with few to none having only one to two physicians in a practice. This has mainly been the result of medical group ownership by health plans or hospitals or as a result of mergers (Solberg, 2006). The large sizes of groups have also made it possible for the groups to enjoy the leadership of a medical director and additional administrative support, which has not been as consistent elsewhere.

With regard to the sample frame, geographic diversity in Minnesota was represented in terms of including both rural and urban locations, but limited to clinic locations that were within one hour of the Twin Cities (Minneapolis and St. Paul, MN) metropolitan area. This was in order to simplify site visits for recruitment and survey arrangements.

Recruitment of the sample was conducted by first sending a letter describing the study to the medical director or lead physician in each group, followed by phone calls from a local study investigator until each group had decided whether to participate. After several months of close follow-up by researchers, three groups declined to participate (each on the grounds of having too much activity at the time) and two groups agreed after the cutoff. Three medical groups participated in pre-testing the survey and audit, leaving 11 groups with complete information for further analysis. The non-responding practice sites were not significantly different from those who agreed to participate in terms of location, size or ownership; therefore, non-response bias does not seem to be an issue.

The 11 medical groups were associated with anywhere from two to 43 practice sites each. When more than six practice sites were associated with a medical group, a random sample of six practice sites were chosen to be part of the study. This resulted in a sampling of 42 practice sites across the 11 medical groups in total. For person level sampling purposes within each practice site, the medical director and/or lead physician along with the quality assurance coordinator, if an existing position, along with up to five physicians and nurses were selected to receive surveys. Each person completing the survey received a $15 gift certificate as an incentive to participate.

In summary, 11 medical groups, consisting of 42 practice sites provided a total of 300 completed surveys. For purposes of study participation, each medical group consisted of one to six practice sites and each practice site returned two to 17 completed surveys. The average response rate of individuals across medical groups was 73% (range of 61% to 94%), which is consistent with or higher than other existing studies recruiting provider organizations in the literature (Solberg, 2006; Kaissi et al., 2004).

## Power Analysis

For this study, survey response data from 300 staff across 42 medical office practice sites were used. Ideally when examining "the statistical relationship between culture and a potential dependent variable, such as performance of the organization, the size of the sample would be determined by the anticipated effect size and the desired power of the study" (Scott et al., 2003b (p. 940). Since secondary data have been utilized for this study, power analysis was not done a priori to estimate the preferred sample size to achieve sufficient power to detect significant relationships, but rather done post hoc to determine what power exists to detect significant relationships based on the sample that has been achieved. Using the G*Power 3.0.8 software tool, with an alpha of 0.05, a medium effect size of 0.3 and a sample size of 300 respondents, the power to detect differences is estimated at 0.99. In other words, the existing study with a sample size of 300 would have a 99% probability with an alpha of 0.05 of finding a 30% difference between means if they existed. Power of .80, has been noted in the literature as an ideal amount of power to detect differences if they do exist.

## Data Management

De-identified data for the study were transferred from the parent study SAS database into SPSS 14.0 for Windows statistical package software for cleansing and analysis purposes. The data were available only to the primary researcher for this study on a secured computer. Duplicate files also existed on a portable hard drive as backup, which remained in the primary researcher's possession. All data were de-identified prior to receipt and each medical group, practice site and individual respondent was given a numerical code. The researcher for this study did not have the capability to determine the identity of any of these entities.

## Variables and Measurement

Variables within this study are primarily related to culture and systems use. Descriptive information related to medical office practice staff and to the practices themselves was also captured. The primary collection vehicle for information on culture, systems use and respondent characteristics was the PPC-RS survey, with information on medical practice characteristics obtained from ICSI. This section provides details related to the study's hypotheses, associated variables and measures.

The independent variables are collegiality, quality emphasis and autonomy. The data for these variables were obtained from staff responses to questions on the PPC-RS survey. They rated organizational culture of the practice using three subscales from the instrument developed by Kralewski et al. (1996). Each cultural characteristic had three to six questions associated with it, with answer choices on a four point scale from 1="not at all" to 4="to a great extent".

The dependent variables are associated with each of the seven domains of practice systems within the PPC-RS survey: registry, clinical information systems, systematic monitoring, clinical reminders, performance tracking and feedback, clinical quality evaluation and improvement, and care management. Respondents rated how well and consistently each type of system worked for their practice based on a four point scale (1=very to 4=not at all) and how useful and helpful each type of system worked for their practice based on a four point scale (1=very to 4=not at all).

In terms of control variables, practice site characteristic data (obtained from ICSI) including practice location, ownership and complexity were factored into the model as covariates since as determined by literature review they may be associated with quality, efficiency and the adoption of practice systems and may have an impact on any relationships seen between the independent and dependent variables. As mentioned in the discussion of study design and validity, internal validity can be influenced by the control of extraneous variables. By accounting for their probable impact, it may become easier to isolate the portion of the variance in the dependent variable attributable to the independent variable and can also help to mitigate the threat of selection (Polit & Beck, 2004).

Practice location was measured by a dichotomous variable; whether the practice was located in an urban or rural location, and added to the model as a control. Although medical office practices within the study are generally within the same part of the country, (within an hour of the twin cities of Minneapolis and St. Paul, Minnesota), there may still be differences inherent in whether the practice is located in closer proximity to a

city/metropolitan area (urban area) or to a town (rural area). Differences between urban and rural practices may include access to resources for practices, income level of patients and payment capabilities, population density, ethnic diversity of patients, and proximity to other practices (providing possible cooperative opportunities between organizations). Each of these characteristics may have an impact on whether practices are likely to adopt such innovations such as practice systems. For example, Goes & Park (1999) found support for the relationship between interorganizational links and innovation implementation related to hospital services. The amount and degree of interorganizational links varied as a function of hospital locale and proximity to other hospitals. In a study by Kaissi et al. (2007) to study the fit between organizational culture and structure on medication errors, practice location (rural or urban) was used as a control variable. The results of the study showed that location has a statistically significant separate effect on medication errors.

Practice ownership was measured by a dichotomous variable: whether the practice is owned by physicians or by a health system (i.e., health plan, hospital or university), and was added to the model as a control. Ownership of medical office practices by health systems (rather than by physicians) is thought to include a greater number of hierarchical levels. Hierarchical levels increase structural complexity, which may have an impact on function (Curoe, Kralewski, & Kaissi, 2003). In addition, Shortell et al. (2001) suggest the adoption of evidence-based care management practices would be higher among practices affiliated with hospitals or HMOs, given their desire to reduce costs and variation where possible, and their ability to provide additional resources and support.

Based upon research to assess the culture of medical groups, Curoe, Kralewski & Kaissi found that the quality of the medical groups is influenced by ownership of practices (comparing physician owned practices to health plan or hospital owned practices). In addition, in a study to evaluate the extent of adoption of diabetes care management processes and the organizational factors that influence their adoption, Li et al. (2004) found that factors associated with adoption included ownership by hospitals or health maintenance organizations. Shortell et al. (2005) found that groups affiliated with a hospital, health plan, or health system rather than owned solely by physicians were twice as likely be a top performing group. The researchers suggest that affiliation with a system may reflect the availability of a greater amount of resources and support.

Complexity was measured by a dichotomous variable; whether the practice is associated with a medical group that has $\leq 20$ primary care physicians or $> 20$ primary care physicians, and was factored into the model as a control. In the study sample, medical groups with $> 20$ primary care physicians also have five or more clinic sites associated with them. The categorization for complexity was chosen following examples from the literature (Burns, 1995; Casalino et al., 2003; Miller & Bovbjerg, 2002; Robinson, 1999). Practices associated with medical groups with a larger number of primary care physicians are thought to have more time and resources to devote to the implementation of organized quality of care processes (Casalino et al., 2003).

Organizational theory suggests that quality is influenced by organizational size and complexity (Donaldson, 1996). In general larger organizations tend to be more predictable and stable whereas smaller organizations tend to be more flexible (Bennis,

1993). Based upon research to assess the culture of medical groups, Curoe, Kralewski & Kaissi (2003) found that group practice size and degree of complexity affect the structure and the way that the practice functions. In addition, it has been noted that the large size of groups has also made it possible for groups to enjoy the leadership of a medical director and additional administrative support, which has not been as consistent elsewhere (Solberg, 2006). Findings of Goldberg & Kuzel (2009), whose study focused on the relationship between medical practice size and the implementation of elements of the patient-centered medical home (PCMH), showed that practice size was significantly related to PCMH alignment. In Coleman and colleagues' (2009) review of the literature to evaluate the chronic care model's effectiveness in practice redesign, it was found that although many types of practices used the model, most experience pertains to those practices of larger size, with IT and other resources available.

Moving from practice site characteristics to respondent characteristics, respondent data such as age, gender and discipline were factored into the model as covariates since previous research has shown they may influence culture and may have an impact on any relationships seen between the independent and dependent variables. The data for these variables were obtained from answers by medical office practice staff to questions on the PPC-RS survey. Staff responded to the age question by filling in their current age (in years). Discipline was identified through choosing from a number of options including physician, nurse practitioner, physician assistant, RN, LPN, medical assistant, office manager or other (write-in). More than one option could be selected. In relation to this study, these categories were collapsed into four: physician, mid-level

practitioner, nurse and other. Gender was identified by choosing between options for male or female.

Within the organizational culture literature, the notion of cultural unity has been challenged by evidence of subcultures. Parker (2000) and McDonald, Corrigan, Daly and Cromie (2000) have shown that workers identify with different groups within an organization on the basis of such characteristics as age, gender, location of units and job function, years in the organization, significance of role within the organization and education level.

Previous studies in health care such as one done by Shortell, Rousseau, Gillies, Devers and Simons (1991) examining culture in intensive care units (ICUs) showed that answers to culture questions differed depending on staff discipline (i.e. physicians or nurses) and type of shift. This difference in type of response by staff characteristics caused rewording of survey questions to address the issue.

Table 4: Summary of Variables and Measures, follows below with an overview of each variable, its description, corresponding measure and data type.

## Measurement Validity and Reliability

Both the PPC-RS and the Kralewski questions on culture were validated through previous studies. To examine survey reliability and the validity of survey respondent answers for the PPC-RS, two trained and experienced nurse auditors conducted on-site reviews. The auditors met with each participating medical group's quality improvement lead, supplemented by other staff for assessment of information about which they had particular knowledge. For each of the systems examined, the auditors required visual

Table 4. Summary of Variables and Measures

| Variable Type | Variable | Description | Measure | Data Type |
|---|---|---|---|---|
| Independent | Collegiality | A strong sense of belonging to the group. A strong sense of responsibility to help physician colleagues with personal problems. | Likert scale 1 to 4 for each of six questions. | Continuous |
| | Quality Emphasis | Reporting of adverse events is encouraged. Quality of care is goal number one. | Likert scale 1 to 4 for each of six questions. | Continuous |
| | Autonomy | An emphasis on physician individuality. Each physician has the right to practice according to his/her own style. | Likert scale 1 to 4 for each of three questions. | Continuous |
| Dependent | Registry | Allows the office/clinic to group patients by diagnoses and other parameters and uses them to assist in the provision of care. | Likert scale 1 to 4 for two questions related to how well/consistently & how useful/helpful this system worked. | Continuous |
| | Clinical Information Systems | Associated with a database of key patient information that can help to manage patient care. | Likert scale 1 to 4 for two questions related to how well/consistently & how useful/helpful this system worked. | Continuous |

Table 4. Continued.

| | | | |
|---|---|---|---|
| Systematic Monitoring | The use of a database to monitor key indicators of chronically ill patients' medical conditions for information that may require immediate attention. | Likert scale 1 to 4 for two questions related to how well/consistently & how useful/helpful this system worked. | Continuous |
| Clinician Reminders | Special communications intended to help the staff adhere to best practices related to the care of the individual patient. | Likert scale 1 to 4 for two questions related to how well/consistently & how useful/helpful this system worked. | Continuous |
| Performance Tracking and Feedback | Using information systems to aggregate key indicators from a registry or other data source for the purposes of benchmarking performance and informing improvement activities. | Likert scale 1 to 4 for two questions related to how well/consistently & how useful/helpful this system worked. | Continuous |
| Clinical Quality Evaluation and Improvement | A formal process to assess care, develop interventions, and use data to monitor effects. | Likert scale 1 to 4 for two questions related to how well/consistently & how useful/helpful this system worked. | Continuous |
| Care Management | Defined services for managing patients with chronic illness involving multiple practitioners and care between visits. | Likert scale 1 to 4 for two questions related to how well/consistently & how useful/helpful this system worked. | Continuous |

Table 4. Continued.

| | | | | |
|---|---|---|---|---|
| Control | Complexity | Indicates how many primary care physicians and how many clinic sites are associated with the parent medical group. | ≤20 PCPs and <5 clinic sites associated with the parent medical group) or > 20 PCPs and ≥ 5 clinic sites associated with the parent medical group. | Dichotomous |
| | Ownership | Indicates who owns the practice | Physician or health system owned | Dichotomous |
| | Location | Indicates what type of setting the practice is located in (within an hour of the twin cities (Minneapolis and St. Paul) of Minnesota). | Urban (metropolitan area or city (population >20,000)) or rural (town (10,000-20,000)). | Dichotomous |
| | Age | Asks the respondent to write in their age in years. | Age in years. | Continuous, Interval, in years. |
| | Gender | Asks the respondent to choose between male and female. | Male or female. | Dichotomous |
| | Discipline | Asks the respondent to choose their occupation from a list. | Physician, mid-level clinician, nurse or other. | Nominal. Categorical. |

evidence that the system and each of its potential components were present and usable. A researcher or data collection supervisor accompanied the auditors to most of the site visits to monitor them, and several debriefing sessions were conducted with the entire investigator group to clarify and verify the information and its collection process. For each practice system, the predictive value of a positive response was compared to the audit results and the percent agreement was also calculated. Agreement with the audit ranged from 41%-97% for lead physicians and from 24%-82% for other types of staff. Agreement with the on-site audit was highest for quality improvement (97% for lead physicians and 82% for other personnel), moderate for registry (78% for lead physicians and 69% for others), systematic monitoring (66% for lead physicians and 64% for others), performance tracking and feedback (69% for lead physicians and 54% for others) and clinical information systems (71% for lead physicians and 66% for others), and lower for the use of clinician reminders (55% for lead physicians and 53% for others) and care management (less than 50% for both groups) (Scholle et al., 2008). Non-matches between survey respondent choices and those of the auditors were usually the result of false negative reports rather than false positive reports; that is, respondents tended to underreport the existence of practice systems, rather than over report them (Solberg et al., 2008). Although a limitation that may affect this study, this underreporting is likely to underestimate the relationship with practice culture rather than overestimate it.

It is also important to note in relation to validity, the literature was evaluated to help determine which practice systems had a link to positive health outcomes. In support for face validity, the PPC is now being used by Bridges to Excellence, a not for profit

organization leading a national program to recognize and reward providers for implementing solutions in improving quality of care for patients (http://www.bridgestoexcellence.org/PhysicianOffice) as part of its Physician Office Link (POL) program, and a further customized version (PPC-Patient Centered Medical Home (PCMH)) is also being considered by medical specialty societies as an evaluation tool to characterize or qualify practices as medical homes as an opportunity for increased incentive payments (http://www.ncqa.org/tabid/631/Default.aspx).

Testing results for the Kralewski tool showed that it captured important dimensions of practice cultures and identified cultural differences among practices as predicted by organizational theory (Kralewski et al., 1996; Curoe et al., 2003; Kaissi et al., 2004). The instrument had been tested in over 300 medical group practices across the upper Midwest and was revised through an iterative process (Kaissi et al., 2004, Kralewski et al.). Reliability analysis of the culture items showed factor loading scores of .40 or above and Cronbach's alpha for individual items over .80 (Kralewski et al.). In addition, each item was able to identify statistically significant differences in the cultures of the practices (Kralewski et al.).

## Data Analysis

Subsequent to dataset delivery from the primary study's research team, data representing answers to research questions specific to this study (independent variables, dependent variables and covariates) were transferred to a smaller more focused dataset. De-identified data for the study were entered into SPSS 14.0 for Windows statistical package software and analyzed according to the following plan.

*Data Exploration and Cleaning*

Within the new dataset, Likert scale data for cultural characteristic independent variables and practice systems domain dependent variables were re-coded so that the greater amount of the measure was equal to the higher value. As a result, combinations of the variables all possessed the same directionality, making interpretation of results more straight forward. Discipline data were also re-coded from the original eight response choices available on the survey to the four new categories relevant to this study.

The data were then inspected for out-of-range values (through examination of frequencies), univariate outliers (through examination of dichotomous variable split xepercents) and multivariate outliers (through examination of Mahalanobis Distance). Since all questions on the survey relevant to this study were close-ended, other than age, any univariate outliers to appear would likely be the result of coding error within the original dataset. Inspection for multivariate outliers is important given that General Linear Model analyses are sensitive to them.

Evaluation of whether the data are normally distributed was examined through relevant statistics and histogram plots for skewness (symmetry) and kurtosis (peakedness) (Tabachnick & Fidell, 2007). Missing values analysis (MVA) was completed to understand the pattern of missing data such as where they are located, why they have occurred and how extensive they are. Finally, an examination of the zero-order correlation matrix revealed whether collinearity problems existed among predictor variables and/or among dependent variables. It is important to understand whether variables are redundant (exhibit singularity) or are very highly correlated (exhibit

multicollinearity) because they, “may inflate the size of error terms and weaken the analysis” (Tabachnick & Fidell, 2007) (p. 89). This examination also helped to justify the use of factor analysis below.

### *Univariate Analysis*

In fulfillment of the study’s first objective, descriptive statistics were calculated for individual survey respondent variables and medical office practice site level variables to summarize characteristics of the sample and to determine the degree of variation in respondent assessment of culture and systems use. For example, frequency distributions were calculated for categorical data (e.g., gender, discipline, practice location, complexity and ownership) and means and standard deviations calculated for interval data (e.g., age and Likert responses scores for practice systems use and culture).

### *Factor Analysis*

In association with the second study objective, which is to understand whether greater parsimony can be achieved in measures of medical practice culture and/or measures of practice systems, factor analysis was done. Factor analysis is a multivariate data reduction technique that allows for the identification and use of fewer, more-simple variables. It is primarily used to help explain variables in terms of their common dimensions or factors and to condense information from a large number of original correlated variables into a smaller set of dimensions or factors that are uncorrelated, with a minimal information loss (Hair, Anderson, Tatham & Black, 1992).

In general, factor analysis can be used to achieve greater parsimony so the final analysis has fewer variables and fewer degrees of freedom, to validate the dimensions

identified by the instrument authors, to find dimensions of the variables that may be more relevant to the underlying theory, and to reduce the amount of error.

In the case of this study, survey respondents were asked three to six questions for each of three cultural characteristics and two questions for each of seven practice systems use domains. In that the questions asked relate to similar underlying constructs, it would be interesting to know whether any form coherent subsets. These subsets of variables (independent from other subsets) were combined into factors (Tabachnick & Fidell, 2007) producing theory relevant transforms of the variables.

### *Endogeneity Analysis*

As previously mentioned, particularly within correlational studies that are cross-sectional, it is often difficult to determine whether independent variable(s) may be influencing dependent variable(s), or whether dependent variable(s) may be influencing independent variable(s). This situation poses a threat to internal validity and can have a significant impact on conclusions drawn from results. In the case of this study, this threat can be minimized through the support of well-established theories that provide a foundation for the direction of the relationship and/or through specific analytic techniques.

In terms of specific analytical techniques, instrumental variables, which have been widely used in econometrics for more than 50 years but have only been gaining popularity recently in the biostatistical literature, have been used to address this issue (Newhouse and McClellan, 1998). As an example application of this technique, Newhouse and McClellan (1998) used instrumental variable analysis to estimate the

effectiveness of aggressive acute myocardial infarction treatment in the elderly, where a controlled trial could not be done.

In general, strong instrumental variables are generally chosen based on related research or on theories supporting the research. Key properties related to instrumental variable use are as follows: 1) Instrumental variables should influence the independent variable and cause substantial variation in it, and 2) instrumental variables should not influence the dependent variable. If these assumptions are met, "one can then estimate how much variation in the treatment variable that is induced by the instrument-and only that induced variation-affects the outcome measure", (Newhouse and McClellan, 1998) (p. 21).

Related to this study, if one assumes based upon organizational theory that the relationship between culture and structure is interdependent over time, this could mean endogeneity issues may exist between the independent variables of collegiality, quality emphasis and autonomy and the practice systems use dependent variables. While the main postulated relationship is that culture influences practice systems use, it could also be the case that systems use influences practice culture. For example, in medical offices where practice systems are implemented and used, the culture of the practice could change over time to have a greater emphasis on quality and the nature of relationships between physicians could become more collegial and/or less autonomous. This type of two way causality may have an effect both on the results of the statistical models and on the interpretation of results.

In terms of which variables might act as strong instrumental variables, related literature and theory were examined to determine appropriate candidates. For example, results from a study by Curoe et al. (2003) to examine whether the culture of medical practices varies by certain practice characteristics showed culture of medical group practices varies by practice size, ownership and number of specialties. In terms of possible use of any of these variables as strong instruments, determination would need to be made as to whether the use of practice systems also varies by these characteristics. If this is the case, and these variables are related to both the independent and dependent variables, they would not make strong candidates for instrumental variables.

In the end, given this study uses secondary data, variables would need to come either from the primary dataset or another existing one which could be linked. Within the current study's data, correlation analysis was run between covariates and both the independent and dependent variables to assess whether the appropriate relationships exist. Determination was made that strong enough instrumental variables do not exist in the dataset to warrant pursuit of this type of analysis. This outcome is further described in the results section.

### *Regression Analysis*

In association with the third objective to test the specific hypotheses related to culture characterization and systems of care use, multivariate multiple linear regression analysis was performed using the General Linear Model (GLM) procedure in SPSS. GLM is primarily used to model relationships in order to achieve the best linear combination of dependent variables, independent variables and covariates. It takes the

full multivariate form when there are one or more dependent scale variables and one or more categorical and scale predictor variables (Tabachnick & Fidell. 2007).

Specifically, systems use was regressed on culture characteristics, taking into account practice location, ownership and complexity and respondent age, gender and discipline covariates. Results for the full model were generated. The specific main equation is as follows:

Dependent Variables = Control Variables + Independent Variables

Clinical information systems + registry+ systematic monitoring + clinical reminders + performance tracking and feedback + clinical quality evaluation and improvement + care management = location + ownership + complexity + age + gender + discipline + collegiality + quality emphasis + autonomy + error term.

Results consist of multivariate analyses for the dependent variables for each covariate and independent variable, and also an analysis of each dependent variable separately for follow up of significant multivariate relationships. Equations for each systems variable were written using the following model as adapted from research by Kaissi et al. (2004):

System=$\beta_0$ + location + ownership + complexity + age + gender + discipline + $\beta_1$ collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term

Clinical information systems = $\beta_0$ + location + ownership + complexity + age + gender + discipline + $\beta_1$ collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term.

Registry = $\beta_0$ + location + ownership + complexity + age + gender + discipline + $\beta_1$ collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term.

Systematic monitoring = $\beta_0$ + location + ownership + complexity + age + gender + discipline + $\beta_1$ + collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term.

Clinician reminders = $\beta_0$ + location + ownership + complexity + age + gender +

discipline + $\beta_1$ + collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term.

Performance tracking and feedback = $\beta_0$ + location + ownership + complexity + age + gender + discipline + $\beta_1$ collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term.

Clinical quality evaluation = $\beta_0$ + location + ownership + complexity + age + gender + discipline + $\beta_1$ collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term.

Care management = $\beta_0$ + location + ownership + complexity + age + gender + discipline + $\beta_1$ collegiality + $\beta_2$ quality emphasis + $\beta_3$ autonomy + error term.

### *Additional Analysis - Overall Systemness*

The analysis described above will produce results to understand whether culture characteristics are related to systems use in general, and also whether culture characteristics are related to each of the seven practice systems separately. To take the analysis one step further, it would be interesting to understand whether culture characteristics are related to a higher degree of systemness; that is, whether culture is related to practices that have more or less systems overall. The results of this analysis may help shed additional light on the nature of the relationships between the variables.

To begin to answer that research question, it was assumed that the sum of the seven dependent variable factor scores represent systemness. These factor scores were added up, and a mean of the sum was compared to each score. Cases with scores greater than the mean represented a greater degree of systemness and were coded a one for analysis. Cases with scores less than the mean represented a lesser degree of systemness and were coded a zero for analysis. GLM in SPSS was used to examine the amount of variance explained by culture in the hi/lo systemness variable after adjusting for practice

and respondent characteristics, and for the seven systemness domains. That model was then compared to the model with the seven individual systems to see if there was a significant difference.

## Human Subjects

The parent study, through which the data collection originally occurred, was reviewed, approved and monitored by the HealthPartners Institutional Review Board (IRB). The current study uses a de-identified secondary data set; there are no potential risks to participants. The study was submitted to the Institutional Review Board at Virginia Commonwealth University, Office of Research Subject and Protection where it underwent exempt review and was approved.

## Chapter Summary

This chapter described the detail behind the methodology for this study including the construct of the research design and analytical plan for the associated research questions and hypotheses. A review of the study's research design, data sources, survey development and study sample, variables and measures, validity and reliability, and analysis plan was covered.

# CHAPTER 5 – RESULTS

This chapter contains the results of the data analysis following the analytical plan outlined in Chapter 4. First, results of data exploration and cleaning are presented. Next, univariate results are given followed by results of the factor analysis, endogeneity analysis and finally, regression analysis.

## Data Cleaning and Missing Data Analysis

Minimum and maximum values, means, and standard deviations of variables were inspected for plausibility and determined to be appropriate. With regard to dichotomous variables, univariate outliers were identified if splits between categories were larger than 90-10 (Rummel, 1970). Based upon these analyses, no out-of-range values or univariate outliers were found. Multivariate outliers were examined through assessment of Mahalanobis Distance (Tabachnick & Fidell, 2007). Within the dataset, with 35 degrees of freedom at a .001 significance level, there were seven multivariate outliers with Mahalanobis Distance greater than the chi square of 66.619 (Tabachnick & Fidell, 2007). Since General Linear Model (GLM) analyses are sensitive to multivariate outliers, it is important to address them. Therefore, these seven cases were deleted from the dataset, dropping the total sample from 300 to 293 respondents. Given the sample size, this change had an insignificant impact on power. Most independent and dependent variables appeared to be generally normally distributed through examination of z scores and histogram plots for skewness (symmetry) and kurtosis (peakedness) (Tabachnick &

Fidell, 2007). Further examination of normality for independent and dependent variable factors is described below under factor analysis.

With regard to missing values analysis (MVA), frequency distributions were reviewed to understand how extensive missing data were. The analysis showed that a majority of variables had less than 5% missing data with only four having higher than 5%. Of the four variables, two were related to survey questions about the registry practice system (% missing of 6.0 and 6.3), and two of the variables were related to survey questions about the clinical quality evaluation and improvement practice system (% missing of 5.3 and 5.7). Since the percentage of missing values is still relatively low for these four variables, and further missing values analysis showed these data were missing completely at random (Little's MCAR test: Chi-Square = 1195.111, DF = 1150, p = 0.173), all variables were left in the dataset. During the factor analysis procedure (as described below) these data were replaced with their respective means to support the formation of correlation matrices.

In terms of collinearity evaluation, a correlation matrix was examined to identify whether any of the variables exhibited bivariate multicollinearity with a correlation coefficient of greater than 0.9. Significant bivariate correlations did exist within a majority of cultural characteristic question subsets and within practice system question subsets, providing further justification for factor analysis to reduce redundancy, although bivariate correlations exceeding 0.9 were only seen for 4 of the practice systems paired questions.

## Univariate Analysis

The data presented within this section have been adjusted for missing values and for outliers as described previously. This resulted in a sample size 293 survey respondents across 42 medical office practices. The descriptive statistics presented provide information on characteristics of medical office practices, survey respondents, culture and use of systems.

### *Practice Level Characteristics*

Characteristics of the medical office practices within the sample are listed in Table 5 including location, ownership and complexity.

Table 5. Descriptive Statistics of Medical Office Practice Characteristics

| Organizational Characteristics | | *f* (%) |
|---|---|---|
| Location | Urban | 24 (57.1%) |
| | Rural | 18 (42.9%) |
| | Total | 42 (100%) |
| Ownership | Physician | 16 (38.1%) |
| | Health system | 26 (61.9%) |
| | Total | 42 (100%) |
| Complexity | $\leq$20 PCPs & <5 clinic sites associated with parent med group | 10 (23.8%) |
| | >20 PCPs & $\geq$5 clinic sites associated with parent med group | 32 (76.2%) |
| | Total | 42 (100%) |

PCPs=Primary Care Physicians

As seen in the data, a majority of the medical office practices are located in urban rather than rural areas, are health system rather than physician owned and are tied to parent medical groups that are more, rather than less complex.

In this study, a medical office practice was categorized as more or less complex dependent upon the number of primary care physicians and clinic sites associated with its parent medical group. The categorization cut off (i.e., number of physicians, etc.) for complexity was chosen following examples from the literature (Burns, 1995; Casalino et al., 2003; Miller & Bovbjerg, 2002; Robinson, 1999). Interestingly, in the literature, variables such as practice size and complexity have been shown to exert either a positive or negative influence on implementation of innovations. On one hand, practices associated with medical groups with a larger number of primary care physicians are thought to have more time, resources, expertise and support to devote to the implementation of organized quality of care processes (Casalino et al., 2003; Shortell et al., 2001). On the other hand, larger size may signal bureaucracy which could act as a barrier to the implementation of these types of innovations (Shortell et al., 2001).

*Survey Respondent Level Characteristics*

Characteristics of the survey respondents as reported are listed in Table 6, including respondent gender, discipline and age. As seen in the data, a majority of the respondents are female rather than male, are physicians rather than other types of personnel and have a mean age of 44.

Table 6. Descriptive Statistics of Respondent Characteristics

| Respondent Characteristics | | *f* (%) or M (SD) |
|---|---|---|
| Gender | Male | 104 (35.5%) |
| | Female | 185 (63.1%) |
| | Non-response | 4 (1.4%) |
| | Total | 293(100%) |
| Discipline | Physician | 148 (50.5%) |
| | Mid-level clinician | 35 (11.9%) |
| | Nurse | 92 (31.4%) |
| | Other | 17 (5.8%) |
| | Non-response | 1 (0.3%) |
| | Total | 293 (100%) |
| Age in years | | 44.4 (9.1) n=284 |

*Culture*

In partial fulfillment of the study's first objective, to determine the degree of variation in respondent assessment of culture, Table 7 presents information on respondent perception of medical office practice culture for the categories of collegiality, quality emphasis and autonomy. Response choices available ranged from (1) "not at all" to (4) "to a great extent".

Culture characteristics are displayed in the table in descending order from most emphasized to least emphasized in practices as reported by respondents. Results show that in general, 70-80% of respondents perceive the culture in their medical office practices to be more, rather than less, collegial. There was a larger range in responses for aspects of quality emphasis, although a striking percentage of respondents (~90%)

Table 7. Descriptive Statistics of Respondent Perception of Practice Culture

| **Survey Question** | **Response** | | | |
|---|---|---|---|---|
| | 1<br>Not at all | 2 | 3 | 4<br>To a great extent |
| **Collegiality** | | | | |
| A great deal of informal consulting | 0% | 18.6% | 51.7% | 29.7% |
| Candid open communication exists between our physicians and nurses | 1.1% | 19.1% | 50.7% | 29.1% |
| A close collegial relationship among the physicians | 1.7% | 19.9% | 46.2% | 32.2% |
| A strong sense of belonging to the group | 2.1% | 22.5% | 43.2% | 32.3% |
| A strong sense of responsibility to help one of our physicians if he/she has a personal problem | 3.5% | 21.9% | 38.5% | 36.1% |
| A great deal of sharing clinical information | 2.1% | 26.0% | 42.2% | 29.8% |
| **Quality Emphasis** | | | | |
| Quality of care is goal number one | 0.7% | 6.3% | 40.8% | 52.3% |
| We emphasize patient satisfaction | 1.0% | 8.4% | 35.0% | 55.6% |
| We encourage internal reporting of adverse events | 3.2% | 21.8% | 39.1% | 35.9% |
| Physicians who develop inappropriate patient care practices will be talked to | 7.7% | 26.6% | 40.2% | 25.5% |
| There is an open discussion of clinical failures | 11.0% | 41.7% | 34.6% | 12.7% |

Table 7. Continued.

| | | | | |
|---|---|---|---|---|
| **Autonomy**<br>An emphasis on physician individuality; each physician has the right to practice according to his/her own style | 2.5% | 20.4% | 46.3% | 30.9% |
| A feeling that we are each autonomous clinicians but practicing in the same organization for support services | 3.1% | 29.4% | 43.3% | 24.1% |
| A great deal of tolerance of a physicians' idiosyncratic patient care practices | 5.0% | 40.4% | 39.4% | 15.2% |

perceived the culture in their medical office practices to emphasize patient satisfaction and quality of care as goal number one. On average, respondents perceived the culture in their medical office practices to be more, rather than less, autonomous.

*Practice Systems*

Also in partial fulfillment of the study's first objective to determine the degree of variation in respondent assessment of practice systems, Table 8 presents information on respondent perception of practice systems use. Question 1 asked how well and consistently each office practice system works at the office, while Question 2 asked how useful and helpful each practice system is in patient care at the office. Answer response choices available ranged from (1) "not at all" to (4) "very".

Practice systems are displayed in the table in descending order from most consistently used and helpful to least, as reported by respondents. Results show that clinical information systems and clinical quality evaluation and improvement are the two

Table 8. Descriptive Statistics of Respondent Perception of Practice Systems Use

| Practice System | Q1 Consistency of System Use | | | | Q2 Helpfulness of Systems | | | |
|---|---|---|---|---|---|---|---|---|
| | Response | | | | | | | |
| | 1 Not at all | 2 | 3 | 4 Very | 1 Not at all | 2 | 3 | 4 Very |
| **Clinical Info Systems** | 0.7% | 12.8% | 48.4% | 38.1% | 1.4% | 15.2% | 39.0% | 44.5% |
| **Clinical Quality Evaluation** | 15.2% | 15.2% | 50.2% | 19.5% | 15.2% | 15.6% | 43.5% | 25.7% |
| **Systematic Monitoring** | 23.3% | 27.4% | 38.5% | 10.8% | 23.5% | 24.2% | 33.3% | 18.9% |
| **Performance Tracking** | 31.9% | 18.6% | 35.4% | 14.0% | 33.2% | 16.3% | 32.5% | 18.0% |
| **Clinician Reminders** | 46.3% | 11.0% | 24.9% | 17.8% | 45.9% | 10.3% | 24.9% | 18.9% |
| **Registry** | 36.5% | 19.3% | 32.5% | 11.7% | 36.4% | 22.2% | 26.2% | 15.3% |
| **Care Management** | 70.0% | 11.1% | 15.0% | 3.9% | 70.0% | 10.4% | 12.5% | 7.1% |

practice systems perceived to work most well and consistently and are perceived to be most useful and helpful within practices. Care management is perceived to be used least consistently.

## Factor Analysis

In fulfillment of the study's second objective, to understand whether any of the survey questions representing the three culture constructs and the seven domains of practice systems can be combined into a more reduced set of variables for each construct,

factor analysis, following principal component analysis and finally factor rotation, was performed.

## Independent Variables

Using principle component analysis, the independent variables were subjected to the Kaiser criterion to choose factors (SPSS, 14.0). This method requires that only factors with eigenvalues greater than one be retained for analysis. Three factors were isolated. The factors were then rotated to maximize observed variable loadings on each of the factors, while retaining their orthogonality or independence. The analysis revealed that 62% of the overall variance is explained by three factors. Table 9 contains the rotated factor loading scores. Factor loadings of .55 and above, which represent good factor loading, are marked in the table with an asterisk.

Factor scores for the three factors were used in the multivariate models, reducing the number of independent variables from 15 to three. The loading of the observed variables distributed across the factors is consistent with original expectations. That is, a factor was created for the sets of questions associated with each cultural characteristic. More specifically, the six variables associated with survey responses regarding aspects of collegiality (informal consulting, sharing of information, a sense of belonging, etc.), loaded onto a factor representing collegiality. The six variables associated with survey responses regarding aspects of quality emphasis (e.g., reporting of adverse events, work monitored, discussion of failures, etc.) loaded onto a factor representing quality emphasis. The three variables associated with survey responses regarding aspects of

Table 9. Rotated Factor Loading Scores on Independent Variables

| **Independent Variable** | **Factor 1** | **Factor 2** | **Factor 3** |
|---|---|---|---|
| | Collegiality | Quality Emphasis | Autonomy |
| A great deal of informal consulting | .620* | .199 | .154 |
| A great deal of sharing clinical information | .754* | .255 | .069 |
| A closel relationship among the physicians | .840* | .184 | .011 |
| A strong sense of belonging to the group | .822* | .276 | .082 |
| A strong sense of responsibility to help one of our physician with a personal problem | .691* | .276 | -.037 |
| Candid open communication exists between our physicians and nurses | .606* | .356 | .038 |
| Physicians who develop inappropriate patient care practices will be talked to | .268 | .738* | .074 |
| We encourage internal reporting of adverse events | .171 | .789* | .014 |
| The quality of each physician's work is closely monitored | .204 | .791* | -.023 |
| There is an open discussion of clinical failures | .340 | .691* | .029 |
| We emphasize patient satisfaction | .229 | .673* | .018 |
| Quality of care is goal number one | .333 | .635* | -.004 |
| An emphasis on physician individuality; each physician can practice according to own style | .155 | .099 | .812* |
| A feeling that we are each autonomous clinicians but practicing in the same organization for support services | .063 | .121 | .833* |
| A great deal of tolerance of a physicians' idiosyncratic patient care practices | -.032 | -.176 | .821* |

*Factors with a loading of .55 or more.

autonomy (e.g., physician individuality, idiosyncratic practices accepted, etc.) loaded onto a factor representing autonomy.

The distribution of the factor scores were inspected for plausibility and determined to be appropriate. Multivariate outliers were examined through assessment of Mahalanobis Distance (Tabachnick & Fidell, 2007). Within the dataset, with three degrees of freedom at a .001 significance level, no multivariate outliers with Mahalanobis Distance greater than the chi square of 16.266 were found (Tabachnick & Fidell, 2007). The factor scores appeared to be generally normally distributed through examination of relevant statistics and histogram plots for skewness (symmetry) and kurtosis (peakedness) (Tabachnick & Fidell, 2007).

The squared loadings are percent variance explained in the observed variables. For example for the last culture variable, .81 squared + .83 squared + .82 squared divided by three tells you the average true variance captured by the factor. Each of the three has approximately the same percent variance explained. The transformation to a factor score improves construct validity and produces a cleaner, independent measure for further analysis. Squares of the other factor loadings show that the other observed variances contributed less than a percent each which further establishes validity.

### *Dependent Variables*

Factor analysis of the 14 observed variables, followed by orthogonal rotation, revealed that 94% of the variance was explained by seven factors. Table 10 contains the variables loading on each factor. Factor loadings of .55 and above, which represent good factor loading, are marked in the table with an asterisk.

Table 10. Rotated Factor Loading Scores on Dependent Variables

| **Dependent Variable** | **Factor 1** | **Factor 2** | **Factor 3** | **Factor 4** | **Factor 5** | **Factor 6** | **Factor 7** |
|---|---|---|---|---|---|---|---|
| | CM | CR | CQEI | SM | PTF | R | CIS |
| **CIS** Q1 | .074 | .039 | .136 | .040 | .061 | .149 | .893* |
| **CIS** Q2 | .081 | .086 | .039 | .148 | .041 | .100 | .897* |
| **R** Q1 | .123 | .182 | .119 | .175 | .176 | .900* | .148 |
| **R** Q2 | .118 | .194 | .132 | .179 | .173 | .891* | .160 |
| **SM** Q1 | .094 | .152 | .118 | .908* | .132 | .185 | .101 |
| **SM** Q2 | .100 | .151 | .140 | .912* | .146 | .143 | .112 |
| **CR** Q1 | .095 | .932* | .105 | .128 | .155 | .176 | .086 |
| **CR** Q2 | .083 | .918* | .136 | .181 | .174 | .176 | .057 |
| **PTF** Q1 | .151 | .186 | .242 | .151 | .885* | .190 | .075 |
| **PTF** Q2 | .133 | .178 | .244 | .160 | .894* | .173 | .052 |
| **CQEI** Q1 | .146 | .128 | .906* | .134 | .214 | .145 | .102 |
| **CQEI** Q2 | .149 | .118 | .907* | .134 | .235 | .098 | .105 |
| **CM** Q1 | .956* | .073 | .134 | .093 | .123 | .101 | .087 |
| **CM** Q2 | .953* | .096 | .136 | .093 | .119 | .113 | .082 |

Systems Abbreviations:
CIS: clinical information systems, R: registry, SM: systematic monitoring, CR: clinician reminders, PTF: performance tracking and feedback, CQEI: clinical quality evaluation and improvement, CM: care management

Questions: Q1: How well and consistently does this practice system work at your office/clinic, Q2: How useful and helpful is this practice system in patient care at your office/clinic

Factor scores for the seven factors were used in the multivariate models, reducing the number of independent variables from 14 to seven. A factor was created for the pairs of questions associated with each practice system. More specifically, for example, the two variables associated with survey responses regarding aspects of clinical information systems (i.e., how well and consistently the clinical information systems were used, and how useful and helpful the clinical information systems are) loaded onto a factor representing clinical information systems. This pattern was repeated for the other six sets of practice system variables.

The distribution of factor scores was inspected for plausibility and determined to be appropriate. Multivariate outliers were examined through assessment of Mahalanobis Distance (Tabachnick & Fidell, 2007). Within the dataset, with seven degrees of freedom at a .001 significance level, no multivariate outliers with Mahalanobis Distance greater than the chi square of 24.322 were found (Tabachnick & Fidell, 2007). While three of the factor scores (for systematic monitoring, performance tracking and feedback, and registry) appeared to be generally normally distributed through examination of relevant statistics and histogram plots for skewness (symmetry) and kurtosis (peakedness) (Tabachnick & Fidell, 2007) four of the factor scores did not (i.e., their z scores were greater than 3.3). Factor 1 (care management) was positively skewed, factors 3 (clinical quality evaluation and improvement) and 7 (clinical information systems) were negatively skewed and factor 2 (clinician reminders) was shown to have negative kurtosis. Varied square root transformations were applied to all factors. Factors 3 and 7

with negative skewness were converted to variables with positive skewness before transformation (reflection) and then converted back after transformation (rereflection) in order to maintain appropriate directionality.

Table 11 shows the method for transformation of the dependent variable factor scores and the resulting difference in the z scores for skewness and kurtosis. While z scores for factors 2, 3 and 7 fell below 3.3 after transformation, although improvement was shown, the skewness z score for factor 1 did not.

Table 11. Transformation of Dependent Variables

| **Variable** | **Before Transformation** | **How Handled** | **After Transformation** |
|---|---|---|---|
| Factor 1 | Skewness z score= 8.48<br>Kurtosis z score= 1.39 | NEWX=SQRT/(X+1.3) | Skewness z score= 4.18<br>Kurtosis z score= -0.94 |
| Factor 2 | Skewness z score= .937<br>Kurtosis z score= -4.24 | NEWX=SQRT(X+2) | Skewness z score= -2.06<br>Kurtosis z score= -2.77 |
| Factor 3 | Skewness z score= -4.70<br>Kurtosis z score= 0.14 | NEWX=SQRT (3.2-X) | Skewness z score= -1.81<br>Kurtosis z score= -1.44 |
| Factor 7 | Skewness z score= -4.08<br>Kurtosis z score= 0.33 | NEWX=SQRT(2.7-X) | Skewness z score= -1.32<br>Kurtosis z score= -1.99 |

Once the transformations were complete, data distributions along with multivariate outliers and assumptions for normality were reexamined and determined to be without issue. As a final validation step, correlations were run between the original observed variables, their associated factor scores and their transformed factor scores. Positive correlations were found between the three sets for each construct showing that directionality associated with the observed variables was maintained throughout the transforms.

## Endogeneity Analysis

As discussed in the methods section above, the case could be made that all three cultural characteristic variables, collegiality, quality emphasis and autonomy are potentially endogenous in this model. The literature was examined to determine which variables might act as strong instrumental variables in order to help control for this issue. Although no suitable instrumental variables were found to have been created for this specific use in previous studies, variables were found in the literature with characteristics that might make them good candidates. That is, they influence the independent variable(s) (culture), but do not influence the dependent variable(s) (practice systems use).

In terms of influence on culture, results from a study by Curoe et al. (2003) showed culture of medical group practices is influenced by practice size and ownership. Within the organizational culture literature, Parker (2000) and McDonald et al. (2000) showed that characteristics such as respondent age and gender influence culture of organizations. Shortell et al. (1991) found that answers to culture questions differed depending on staff discipline (i.e., physicians or nurses) in intensive care units. Given the use of secondary data for this study, ultimately, any instrumental variables to be used would either need to exist in the current database or be pulled in from another established database and linked to existing data. To this end, correlation analysis was run between sets of control variables and both the independent and dependent variables in the existing database to assess whether the appropriate relationships exist.

Table 12 shows correlation results for the control and independent variables while Table 13 shows correlation results for the control and dependent variables. Independent and dependent variables are represented by their factor scores.

Table 12. Correlations between Control and Independent Variable Factor Scores

| | | Collegiality Factor Score | Quality Emphasis Factor Score | Autonomy Factor Score |
|---|---|---|---|---|
| Practice Level | Location | .082 | .041 | -.097 |
| | Ownership | -.231* | -.115* | .029 |
| | Complexity | -.034 | -.059 | -.039 |
| Respondent Level | Age | .057 | .029 | -.009 |
| | Gender | -.138* | .146* | .000 |
| | Discipline-physician | .043 | -.207* | -.084 |
| | Discipline-mid-level | .068 | .038 | .102 |
| | Discipline-nurses | -.080 | .136 | .009 |

*Statistically significant p<.05

Table 13. Correlations between Control and Dependent Variable Factor Scores

| | | CM | CR | CQEI | SM | PTF | R | CIS |
|---|---|---|---|---|---|---|---|---|
| Practice Level | Location | -.225* | .120* | .159* | -.001 | .185* | .067 | -.116* |
| | Ownership | -.061 | .048 | -.145* | -.011 | -.101 | -.232* | -.122* |
| | Complexity | .075 | -.247* | .040 | -.152* | -.036 | -.349* | .021 |
| Respondent Level | Age | .098 | -.126* | .075 | .021 | -.086 | -.136* | .005 |
| | Gender | -.018 | .095 | -.048 | .032 | -.104 | .007 | .134* |
| | Discipline-physicians | -.080 | -.001 | .026 | -.091 | .124* | .070 | -.048 |
| | Discipline-mid-level | -.044 | -.076 | -.037 | .041 | -.071 | .017 | -.012 |
| | Discipline-nurses | .072 | .011 | -.016 | .036 | -.159* | -.099 | .115* |

*Statistically significant p<.05

Results from this analysis show that there are no variables in this dataset that would make strong instrumental variables for this study. That is, there are no variables that influence the independent variables that do not also influence the dependent variables. The three largest correlations in the tables are .35 and two in the mid .20's, suggesting that there was no pattern of relationship that would suggest causality either way.

While the inability to do a formal endogeneity analysis is recognized as a limitation of the study, follow up analysis indicates that the current model may be robust enough to be unaffected by potentially endogenous variables. Results of running the model with and without each of the potentially endogenous independent variables show no major changes in the direction and significance of the predictor variables.

## Multivariate Analysis

In fulfillment of the study's third objective to test whether there is a relationship between medical practice culture and medical practice systems use, multivariate multiple linear regression analysis using the general linear model procedure in SPSS was used. Systems use was regressed on culture characteristics, taking into account practice location, ownership and complexity and respondent age, gender and discipline covariates. The best solution for all dependent variables was analyzed against each independent variable. More specifically, test results were generated for each independent variable's influence on practice systems in general (all seven systems combined). Follow-up was done analyzing each independent variable's influence on each of the seven dependent variables, separately.

*Full Model*

Table 14 shows the multivariate relationship between medical office practice characteristics, respondent characteristics, culture characteristics and the seven practice systems dependent variables together. Eta-squared (1-Wilks' Lambda) shows the percent of variance explained by each of the covariates (practice and respondent characteristics) and each of the independent variables (culture characteristics) in the seven practice systems dependent variables. Eta-squared can be summed to produce the total variance explained in the seven practice systems dependent variables by the covariates and independent variables together.

In terms of relationships, the full model shows the cultural characteristic independent variables, collegiality (Lambda=.908, df= 7/263, p=.001) and quality emphasis (Lambda=.782, df= 7/263, p=.000) as significantly related to the seven practice systems dependent variables, each accounting for about 9.2% and 21.8% of the variance respectively. A statistically significant relationship between autonomy and the practice systems was not seen.

In addition, all three practice characteristic covariates (location (Lambda=.859, df= 7/263, p=.000), ownership (Lambda=.947, df= 7/263, p=.043) and complexity (Lambda=.808, df= 7/263, p=.000)) were shown as significantly related to the seven practice systems dependent variables; each accounting for about 14.1%, 5.3% and 19.2% of the variance, respectively. In terms of respondent characteristic covariates, the model shows discipline-mid-level (Lambda=.939, df= 7/263, p=.019) and discipline-nurses (Lambda=.925, df= 7/263, p=.004) as significantly related to the seven practice systems

Table 14. Full Model Multivariate Test Results

| Variable | Wilks' Lambda | Eta - Squared | Hypothesis df | Error df | Sig |
|---|---|---|---|---|---|
| **Location** | .859 | .141 | 7.000 | 263.000 | .000* |
| **Ownership** | .947 | .053 | 7.000 | 263.000 | .043* |
| **Complexity** | .808 | .192 | 7.000 | 263.000 | .000* |
| **Age** | .953 | .047 | 7.000 | 263.000 | .080 |
| **Gender** | .965 | .035 | 7.000 | 263.000 | .215 |
| **Discipline-MDs** | .949 | .051 | 7.000 | 263.000 | .051 |
| **Discipline-Mid-level** | .939 | .061 | 7.000 | 263.000 | .019* |
| **Discipline-Nurses** | .925 | .075 | 7.000 | 263.000 | .004* |
| **Collegiality** | .908 | .092 | 7.000 | 263.000 | .001* |
| **Quality Emphasis** | .782 | .218 | 7.000 | 263.000 | .000* |
| **Autonomy** | .952 | .048 | 7.000 | 263.000 | .072 |

*Statistically significant p<.05

dependent variables, each accounting for about 6.1%, and 7.5% of the variance, respectively.

Overall the data show that about 83.2% of the variance is accounted for by these variables, with the cultural characteristic quality emphasis making the highest relative

contribution and the covariate practice complexity making the second highest contribution.

Table 15 shows the explained variance for the relationship between each of the predictors and each of the practice system dependent variables. It also shows the total explained variance in each of the practice system dependent variables for all predictors. Eta–squared was calculated for each practice system dependent variable associated with the full model by adding together the sums of squares for each predictor and dividing by the total sums of squares for the model. Eta-squared was calculated for each practice system dependent variable as associated with each predictor by dividing the sums of squares for that dependent variable by the total sums of squares. The table includes the corrected total sums of squares for replication of the eta squared calculations.

Table 15. Explained Variance between Each Predictor and Each Practice System

| Source | Dependent Variable | Type III Sum of Squares | Eta-squared (ssq/totalssq) | F | B | Sig |
|---|---|---|---|---|---|---|
| **Corrected Model** | CM | 6.190 | .125 | 3.507 | | .000 |
| | CR | 5.278 | .131 | 3.702 | | .000 |
| | CQEI | 3.533 | .161 | 4.677 | | .000 |
| | SM | 15.643 | .055 | 1.414 | | .166 |
| | PTF | 36.594 | .129 | 3.626 | | .000 |
| | R | 49.661 | .182 | 5.425 | | .000 |
| | CIS | 2.905 | .113 | 3.107 | | .001 |
| **Location** | CM | 3.100 | .063 | 19.321 | -.221 | .000* |
| | CR | .290 | .007 | 2.237 | .068 | .136 |
| | CQEI | .457 | .021 | 6.653 | .085 | .010 |
| | SM | .491 | .002 | .488 | -.088 | .486 |
| | PTF | 8.078 | .029 | 8.805 | .357 | .003* |
| | R | .333 | .001 | .400 | -.072 | .527 |
| | CIS | .417 | .016 | 4.909 | -.081 | .028 |

Table 15. Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| **Ownership** | CM | .235 | .005 | 1.463 | -.063 | .227 |
| | CR | .281 | .007 | 2.170 | .069 | .142 |
| | CQEI | .078 | .004 | 1.130 | -.036 | .289 |
| | SM | .034 | .000 | .033 | .024 | .855 |
| | PTF | .012 | .000 | .013 | .014 | .911 |
| | R | 5.815 | .021 | 6.988 | -.313 | .009 |
| | CIS | .222 | .009 | 2.608 | -.061 | .108 |
| **Complexity** | CM | .001 | .000 | .003 | .003 | .953 |
| | CR | 1.679 | .042 | 12.956 | -.183 | .000* |
| | CQEI | .197 | .009 | 2.865 | .063 | .092 |
| | SM | 6.195 | .022 | 6.158 | -.351 | .014 |
| | PTF | .149 | .001 | .162 | .054 | .687 |
| | R | 27.097 | .100 | 32.561 | -.735 | .000* |
| | CIS | .026 | .001 | .309 | .023 | .579 |
| **Age** | CM | .268 | .005 | 1.667 | .003 | .198 |
| | CR | .474 | .011 | .3654 | -.005 | .057 |
| | CQEI | .081 | .004 | 1.179 | .002 | .279 |
| | SM | .020 | .000 | .020 | .001 | .887 |
| | PTF | 1.624 | .006 | 1.770 | -.009 | .184 |
| | R | 2.661 | .010 | 3.197 | -.011 | .075 |
| | CIS | .013 | .001 | .150 | .001 | .699 |
| **Gender** | CM | .491 | .010 | 3.060 | -.109 | .081 |
| | CR | .212 | .005 | 1.633 | .071 | .202 |
| | CQEI | .000 | .000 | .006 | -.003 | .937 |
| | SM | .330 | .001 | .328 | -.089 | .567 |
| | PTF | .373 | .001 | .406 | -.095 | .525 |
| | R | .308 | .001 | .371 | .086 | .543 |
| | CIS | .396 | .015 | 4.659 | .098 | .032 |
| **Discipline-physicians** | CM | .534 | .010 | 3.328 | -.202 | .069 |
| | CR | .009 | .000 | .069 | -.026 | .792 |
| | CQEI | .001 | .000 | .011 | .008 | .916 |
| | SM | 1.319 | .005 | 1.312 | -.317 | .253 |
| | PTF | 3.378 | .012 | 3.682 | -.507 | .056 |
| | R | .026 | .000 | .031 | .044 | .861 |
| | CIS | .538 | .021 | 6.333 | .203 | .012 |
| **Discipline-mid-level** | CM | .549 | .011 | 3.421 | -.223 | .065 |
| | CR | .206 | .005 | 1.591 | -.136 | .208 |
| | CQEI | .033 | .001 | .486 | -.055 | .486 |
| | SM | .139 | .000 | .138 | -.112 | .711 |
| | PTF | 6.140 | .022 | 6.692 | -.745 | .010 |
| | R | .021 | .000 | .025 | .043 | .875 |

Table 15. Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| | CIS | .261 | .010 | 3.068 | .153 | .081 |
| **Discipline-nurses** | CM | .073 | .001 | .454 | -.072 | .501 |
| | CR | .113 | .003 | .872 | -.089 | .351 |
| | CQEI | .012 | .001 | .171 | -.029 | .680 |
| | SM | .347 | .001 | .345 | -.157 | .557 |
| | PTF | 9.805 | .035 | 10.688 | -.832 | .001* |
| | R | .486 | .002 | .584 | -.185 | .445 |
| | CIS | .545 | .021 | 6.412 | .196 | .012 |
| **Collegiality** | CM | .349 | .007 | 2.173 | .037 | .142 |
| | CR | .005 | .000 | .040 | -.004 | .842 |
| | CQEI | .684 | .031 | 9.960 | .051 | .002* |
| | SM | 3.068 | .011 | 3.049 | .109 | .082 |
| | PTF | 2.684 | .010 | 2.926 | .102 | .088 |
| | R | .065 | .000 | .078 | .016 | .780 |
| | CIS | .145 | .006 | 1.701 | .024 | .193 |
| **Quality Emphasis** | CM | .739 | .015 | 4.603 | .054 | .033 |
| | CR | 1.170 | .029 | 9.025 | .068 | .003* |
| | CQEI | 1.418 | .064 | 20.650 | .075 | .000* |
| | SM | 2.083 | .007 | 2.071 | .091 | .151 |
| | PTF | 3.937 | .014 | 4.292 | .125 | .039 |
| | R | .282 | .001 | .339 | .033 | .561 |
| | CIS | .811 | .031 | 9.543 | .057 | .002* |
| **Autonomy** | CM | .182 | .004 | 1.133 | -.026 | .288 |
| | CR | .063 | .002 | .487 | -.015 | .486 |
| | CQEI | .142 | .006 | 2.067 | .023 | .152 |
| | SM | .029 | .000 | .029 | .010 | .865 |
| | PTF | 2.518 | .009 | 2.745 | -.096 | .099 |
| | R | 4.139 | .015 | 4.975 | -.122 | .027 |
| | CIS | .122 | .005 | 1.433 | .021 | .232 |
| **Corrected Total** | CM | 49.353 | | | | |
| | CR | 40.142 | | | | |
| | CQEI | 22.009 | | | | |
| | SM | 286.273 | | | | |
| | PTF | 283.377 | | | | |
| | R | 273.520 | | | | |
| | CIS | 25.769 | | | | |

*Statistically significant p<.007

Examination of eta squared statistics allows for judgment about which independent variable or covariate is most important and where it is occurring (i.e., in relation to which

practice system dependent variable). The beta weight shows the magnitude and direction for each of the cultural characteristic independent variables and covariates (practice and respondent) in relation to each of the practice system dependent variables. This allows for comparison of each of the independent variables and covariates to one another in terms of importance level in relation to each dependent variable. The bonferroni adjustment was applied to the significance level and calculated as $p<.05$ divided by seven (for seven dependent variables) which equals .007. This correction is made since the chance of type II error increases when running multivariate tests a second time. The first test was all seven dependent variables at once; the follow up test was for each dependent variable separately.

Results show that the use of clinical quality evaluation and improvement systems is more likely in practices that have a greater emphasis of collegiality culture. The use of clinician reminders, clinical quality evaluation and improvement systems and clinical information systems is more likely in practices that have a greater emphasis of quality culture. Although a majority of the relationships between autonomy and the practice systems studied were negative in direction, none were statistically significant.

In terms of covariates and dependent variables, significant relationships are seen between practice location and both care management and performance tracking and feedback, but they are not in the same direction. Urban practices are more likely to use care management systems, whereas rural practices are more likely to use performance tracking and feedback systems. Significant relationships are seen between practice complexity and both clinician reminders and registries, where practices that are less

complex (≤20 PCPs & <5 clinic sites associated with parent medical group) are more likely to use these systems. Finally significant relationships are seen between respondent discipline-nurses and performance tracking and feedback, where respondents whose job title is other than nurse are more likely to influence the use of this system.

## Additional Analysis - Overall Systemness

In terms of understanding whether culture characteristics are related to the existence of a majority of systems rather than individual systems, a comparison was made between a model including a hi/lo systemness variable and the full model including the seven separate systemness domain variables discussed above. Systemness was represented by a mean split of the sum of the seven dependent variable factor scores. These factor scores were added up, and a mean of the sum was compared to each score; cases greater than the mean represented a greater degree of systemness. GLM in SPSS was used to examine the amount of variance explained by culture in the hi/lo systemness variable after adjusting for practice and respondent characteristics, and for the seven systemness domains. That model was then compared to the model with the seven individual systems to see if there was a significant difference.

This comparison showed that although the hi/lo variable ($R^2$=.326) was about 5% less related than the seven systems variables ($R^2$ =.375), the difference was not statistically significant (SS=3.380, df=7, MS=.483, F=3.043). Statistical evidence suggests that in the population, culture seems to influence a high or low degree of systemness in the same way it influences the existence of systems in general (represented by the original dependent variable.)

## Chapter Summary

This chapter summarized the results of the study, including data cleaning and missing data analysis, descriptive statistics, factor analysis, endgogeneity analysis and regression analysis. Interpretation of these results will be reviewed in the next chapter.

# CHAPTER 6 – CONCLUSIONS

This chapter provides a review of the study's key findings, a discussion of the conclusions that can be drawn from results, and implications for medical practice, policy and health services research. It also reviews limitations of the study and possible areas for future research.

## Review and Discussion of Key Findings

The primary purpose of this study was to examine the relationship between cultural characteristics of medical office practices and medical office practice systems employed to improve quality of care. The way in which each of the study's objectives was met, and a discussion of associated key results, are listed below.

Objective 1: To characterize the degree of variation in medical practice respondents' assessment of culture and of systems use.

This was accomplished through a descriptive analysis of respondent report of cultural characteristics and the use of systems in medical office practices. Results show that overall, all three cultural characteristics, collegiality, quality emphasis and autonomy, seem to be emphasized in these medical office practices. These findings support those of previous research. Wallace (1995) found that collegiality and autonomy are values that are deeply rooted in professional organizations. Autonomy in particular is a value that has traditionally existed among health professionals and is ingrained in their training (Leape & Berwick, 2005). Quality emphasis seems to align itself with the Hippocratic Oath

physicians take to “first, do no harm” and has been found to exist in medical office practices that provide higher quality of care (Shortell et al., 2005).

Between the three cultural characteristics, most emphasis was placed on collegiality with about 77% of respondents who perceived the culture in their practices to be collegial, while 70% perceived the culture in their practices to emphasize quality. Less emphasis was given to autonomy, where about 66% of respondents perceived their practices to possess this cultural characteristic. Surprisingly, the emphasis of quality was stronger than the emphasis of autonomy among these practices. This relationship was reversed in previous research (Kaissi et al., 2004). This may be due to the practices in this study being part of the Institute for Clinical Research Systems Improvement (ICSI), a quality improvement collaborative that includes most of the medical groups and hospitals in Minnesota, where they have been exposed to education on quality improvement processes. This may have made them more team oriented and focused on quality with movement away from their autonomous nature.

In terms of the seven practice systems, clinical information systems and clinical quality evaluation and improvement were reported as the top two systems, with about 85% and 70% of respondents reporting they were either moderately or very consistently used and helpful, respectively. Both of these systems involve using data to track care for patients and appear to be basic tools for patient care and quality improvement efforts. Clinical quality evaluation and improvement systems also involve developing quality improvement interventions and follow-up on results. Results for these systems appear to be much higher than those seen in previous studies, where less than 30% of practices

reported using electronic systems for medications prescribed, lab results, performance measurement, etc. (Casalino et al., 2003; Goldberg & Kuzel, 2009). High utilization for these systems as found in this study may be driven by the participation of these practices in the ICSI quality improvement collaborative, where support such as education is given for these types of initiatives.

Care management systems use, on the other end of the spectrum, was reported by less than 20% of respondents as so. This type of system involves managing care for patients with chronic illness including coordination between multiple practitioners and care between office visits. These systems may not be used as consistently by practices because of the time and resource commitment above and beyond regular reimbursed patient visits. In support of this assumption, previous studies examining the facilitators and barriers to practice system use have noted lack of resources, reimbursement that does not reward high quality and physician resistance and overwork as barriers to the use of practice systems (Bodenheimer et al., 2004). Data from previous studies show case management systems used by about 40% of practices (Casalino et al., 2003b; Li et al., 2004). As one explanation for the difference, results of survey response reliability for the current study regarding the existence of systems showed care management as the most under-reported of all of the systems tested (Scholle et al., 2008). Under-reporting generally occurred because either the staff did not know the system was in place in the practice or they did not make the connection between the survey question and system in the office. This measurement issue will be discussed further under the methods implications section, below.

The remaining systems (systematic monitoring, performance tracking, clinical reminders, and registries) were reported by between 42 and 50% as either moderately or very consistently used and helpful. These findings are consistent with results from some previous research, but also higher than results from other studies. Both Casalino et al. (2003b) and Li et al. (2004) found that about 40% of practices studied were using registry and reminder systems, whereas Goldberg & Kuzel (2009) found that 19% of practices were reporting registries for multiple diseases and about 30% were using reminder systems. In general, these systems seem to be related in that they appear to be functions that exist in electronic monitoring systems such as electronic health records (EHRs) (Solberg, et al., 2005). In support of this idea, Solberg and colleagues (2005) found that these particular types of practice systems were more than twice as likely to exist in medical groups with an electronic medical record (EMR). Low utilization of these systems may be due to the existence of EHRs varying greatly between practices. In addition, for those practices where an EHR is present, often, not all features of the system are utilized (such as registries, reminder systems, etc.) (Goldberg & Kuzel, 2009). The implementation and use of EHR systems involve a large commitment of resources by practices that some are not willing to make, especially in light of the lack of external incentives to do so (Shortell et al., 2003). Previous studies have shown that although having information systems (IT) such as an EHR does not guarantee the use of these types of systems, they may be necessary for or enhance certain practice system capabilities (Shortell et al., 2003; Solberg et al., 2005). In addition, in general, poor IT

has been found as a barrier to systems use (Bodenheimer et al., 2004; Casalino et al., 2003).

Objective 2: To understand whether any of the survey questions representing the three culture constructs or whether any of the survey questions representing the seven domains of practice systems, or both, are highly correlated and can be combined into a more reduced set of variables for each construct.

This was achieved through separate factor analysis procedures for both the cultural characteristic independent variables and the practice systems dependent variables. Factor scores generated were then used in the multivariate analysis models. The use of factor scores in the multivariate analysis models strengthens the relationships exposed by the analyses, since the error variance has been eliminated. More specifically, through this type of technique, resulting variables are independent. Given this, there becomes a clear cut relationship between each construct not confounded by interactions within the independent variable or dependent variable sets.

For the independent variables, the analysis of 15 observed variables revealed that 62% of the overall variance is explained by three factors. The loading of the observed variables distributed across the factors is consistent with original expectations. That is, a factor was created for the sets of questions associated with each cultural characteristic. These results are in alignment with the findings the authors of the cultural survey questions achieved in their original instrument development analysis (Kralewski et. al, 2005).

For the dependent variables, the analysis of the 14 observed variables revealed that 94% of the overall variance is explained by seven factors. In essence, a factor was created for the pairs of questions associated with each practice system. While correlation analysis results showed that many of the practice systems were significantly associated with each other, the best results for the factor analysis were generated in an extraction of seven factors, with a high percentage of variance explained by the factors, and an overall clean factor structure. With this outcome, greater parsimony has been achieved, with fewer variables and fewer degrees of freedom to be used as part of the multivariate analysis. Dimensions or domains of systems use as identified by the instrument authors have also been validated, and error has been reduced.

Objective 3: To utilize organizational culture theory as a framework to test whether there is a relationship between medical practice culture and medical practice systems use. The following hypotheses were associated with this objective:

- An emphasis of collegiality will be positively associated with innovative practice systems use in medical office practices.
- An emphasis of autonomy will be negatively associated with innovative practice systems use in medical office practices.
- Quality emphasis will be positively associated with innovative practice systems use in medical office practices.

The testing of these hypotheses was accomplished through multivariate multiple linear regression analysis using the general linear model. Systems use was regressed on cultural characteristics, taking into account practice location, ownership and complexity

and respondent age, gender and discipline covariates. The best solution for all dependent variables was analyzed against each independent variable. More specifically, test results were generated for each independent variable's influence on practice systems in general (all seven systems combined). Follow-up was done analyzing each independent variable's influence on each of the seven dependent variables, separately.

In terms of relationships, when looking at all dependent variables together, the model shows the use of practice systems is more likely in practices that emphasize collegiality, explaining about 9.2% of the variance. Significant positive findings between collegiality and practice systems use have support from previous research. Kaissi et al., (2004) found that a culture emphasizing collegiality was associated with use of benchmarking, profiling and guideline use. In addition, benchmarking and guideline use were associated with decreased prescription error rates in practices that encourage collegiality (Kaissi et al., 2007).

The model also shows the use of practice systems is more likely in practices that emphasize a culture of quality, explaining about 21.8% of the variance. This aligns with the results of previous related research as well. More specifically, an organizational culture where quality is valued has been identified as a factor facilitating the adoption of care management processes for chronic care improvement (Bodenheimer et al., 2004; Rundall et al., 2002) and in differentiating high performing versus low performing medical groups (Shortell et al., 2005).

A statistically significant relationship was not found between autonomy and systems use. Previous research relating office practice culture to quality programs also

found that practices oriented more toward autonomy were not associated with any of the quality of care programs evaluated in the study (Kaissi et al., 2004).

Table 16 summarizes the hypotheses for the research study based on relevant theories, their predicted relationship and results following testing.

Table 16. Results of Hypothesis Testing

| Construct | Predicted Association with Implementation of Practice Systems | Study Results |
|---|---|---|
| **Org Culture & Social Network Theory** | | |
| Collegiality Emphasis | + | +* |
| Autonomy Emphasis | - | Not significant |
| **Org Culture & Organizational Learning Theory** | | |
| Quality Emphasis | + | +* |

+ indicates positive relationship; - indicates negative
*relationship is significant at $p<.05$.

When looking at the relationship between each of the independent variables and dependent variables separately, both collegiality and quality emphasis are characteristics of culture that positively influence the use of clinical quality evaluation and improvement systems. Given the investment it takes to implement formal processes to assess care, develop interventions, and use data to monitor the effects, it is understandable that both of these values may increase the likelihood that this type of system is implemented. The use of clinician reminders and clinical information systems is more likely to be used in practices that have a greater emphasis of quality culture. Both of these systems involve tracking and use of specific information to help manage quality patient care. Clinician reminders in particular are related to prompting physicians to adhere to clinical practice guidelines. Although a majority of the relationships between autonomy and the individual

practice systems studied were negative in direction (possibly signifying the belief that these systems may interfere with physician practices and are therefore less likely to be implemented in the context of this value), none was statistically significant.

Table 17 summarizes the results of relationships between culture characteristics and each of the individual practice systems.

Table 17. Summary Results of Relationship between Culture and Individual Practice Systems

| **Practice System** | **Cultural Characteristic** | | |
|---|---|---|---|
| | **Collegiality** | **Quality Emphasis** | **Autonomy** |
| **Care Management** | + | + | - |
| **Clinician Reminders** | - | +* | - |
| **Clinical Quality Evaluation & Improvement** | +* | +* | + |
| **Systematic Monitoring** | + | + | + |
| **Performance Tracking & Feedback** | + | + | - |
| **Registry** | + | + | - |
| **Clinical Info Systems** | + | +* | + |

+ indicates positive relationship; - indicates negative
*the relationship is significant at p<.007.

Interestingly, although not included in the original hypotheses, all three practice characteristic covariates: location, ownership and complexity, and the respondent characteristics discipline-mid-level and discipline-nurses were significantly related to the

use of practice systems, accounting for 52.2% of the variance in the model. The influence of these types of characteristics on organizational performance has been also supported by previous research. Depending upon the study, location, ownership and complexity of medical office practices have been previously shown to influence their innovative nature (Bennis et al., 1993; Casalino et al., 2003; Coleman et al., 2009l; Curoe et al., 2003; Goldberg & Kuzel, 2009; Li et al., 2004; Shortell et al., 2001, Shortell et al., 2005; Solberg et al., 2006).

Overall the data show that about 83.2% (eta-squared) of the variance is accounted for by collegiality, quality emphasis and the covariates referenced above, with most variance as a function of structural variables.

## Theoretical Implications

Organizational culture theory was chosen as the primary theory to help explain the relationship between culture and systems use. Components of social network theory and organizational learning theory were used to help explain the mechanisms by which these relationships may work, and to help develop hypotheses for the study. A review of the literature shows that studies examining organizational characteristics in health care have been lacking when it comes to providing a solid theoretical foundation, and recommendations have been set forth to stress the importance and need for this type of foundation to guide future work (Hearld et al., 2008). The following text will review more specifically how well the theories worked as a framework for the hypotheses in this study.

*Organizational Culture & Social Network Theory*

In the context of organizational culture and social network theory, it was postulated that shared values and beliefs of an organization (collegiality and autonomy) may influence ties between individuals in the organization. These ties in turn may influence how well individuals communicate and share, thus providing the opportunity for acceptance of policies and procedures and diffusion of innovations. With regard to collegiality, it was proposed that there may be a greater number of ties or linkages between individuals, and therefore a higher likelihood of practice systems use. In terms of autonomy, it was proposed that there may be a lesser number of ties or linkages between individuals, and therefore a lower likelihood of practice systems use.

With regard to how well this theoretical model worked to support the proposed relationships, results are mixed. Overall, collegiality was significantly related to systems use, accounting for about 9.2% of the variance, and more specifically, collegiality was significantly related to one of the seven systems, clinical quality evaluation and improvement. Although most all relationships between autonomy and each individual practice system were in the negative direction, they were not statistically significant. In general, given that these findings align with the relationships hypothesized, it may be hasty to completely reject these theories. The lack of significance could have resulted from a Type II statistical error, that is, failing to observe a true relationship, when there indeed is one. This idea will be discussed further within the methods implications section in terms of the predictive value of practice systems self report measures.

However, given the small amount of variance explained and the lack of statistical significance with regard to autonomy, it does call into question whether this was the best model to use. This conclusion will be further discussed below.

*Organizational Culture & Organizational Learning Theory*

In the context of organizational learning theory, it was postulated that shared values and beliefs within an organization (quality emphasis) may influence a strong propensity to learn. This in turn may make it more likely to adapt and change, detect and correct errors, become more innovative, and thus have a greater likelihood of practice systems use.

Results from the study showed that overall, quality emphasis was significantly related to systems use, accounting for about 21.8% of the variance in the model. These findings are nontrivial, especially for a social science study, and imply that culture may have a considerable amount of impact on the innovative nature of practices. In looking at the seven systems variables separately, quality emphasis was significantly related to three of the systems; clinician reminders, clinical quality evaluation and improvement, and clinical information systems.

In general, this study does imply support for the use of organizational culture theory and organizational learning theory to explain the relationship between quality culture and use of innovative practice systems in medical office practices. In addition, results show that organizational learning theory may serve as a better framework for the postulated relationships than social network theory.

### *Appropriateness of the Overall Theoretical Model*

In terms of the study's three main hypotheses, two were supported by the data, and the third (related to autonomy), although not significant, was in the direction hypothesized. Combined, collegiality and quality emphasis accounted for 31% of the variance in the model. When looking at the three cultural characteristics in relation to each of the seven practice systems (21 relationships in all), four significant relationships were found and three of these were associated with quality emphasis. Given these findings, one may be willing to accept the appropriateness of the overall theoretical framework used, but with some reservation. A summary of possible explanations for these findings are offered for consideration.

#### *Measures Used*

One may question whether the measures used in this study are appropriate to reflect the hypothesized relationships. This can be looked at from two different perspectives. First, do the measures represent the constructs laid out in the theoretical model, and second, were the measures themselves valid and reliable. The validity and reliability of measures are discussed further in the section on methods implications, below.

The main theory used to guide this study is organizational culture theory. Based upon the literature surrounding the details of the theory itself, the application of the theory to previous research studies and the research done to develop specific measures of organizational culture, the use of collegiality, quality emphasis and autonomy seemed to have been an appropriate set of measures to represent the organizational culture in this

study. This subset of cultural characteristics was thought to be related most closely with the uptake and use of the structural and systems components by physicians for examination in the study, and was specifically tested for use in medical office practices. The probable link between these specific cultural attributes and structural systems has also been supported by research of others. In a study to evaluate the effect of the fit between organizational culture and structure on medication errors in medical group practices Kaissi et al. (2007) chose autonomy, collegiality and quality emphasis as the three cultural variables to evaluate because, "these variables are expected to influence physician adoption and use of the structural components included in the analyses" and have "the strongest theoretical argument" (p. 16). Their results showed that benchmarking and guideline use associated with decreased error rates in practices that encourage quality emphasis and collegiality. Additional research results in support of the relationships between these cultural characteristics and systems use was described in chapter two.

Based upon results from this study, while the impact of a culture valuing quality seemed to be quite influential on practice systems use, given the smaller amount of variance explained by collegiality, one may question whether there is a better measure that might represent a related construct. As a few previous studies have found a positive relationship between **teamwork** and the adoption of systems, it might have been a more relevant variable choice. Cultures that focus on teamwork have been found to be associated with greater implementation of continuous quality improvement practices and achieve higher functional health status in patients with chronic conditions (Shortell, Jones

& Rademaker, 2000; Shortell, O'Brien & Carman, 1995). While collegiality and teamwork are seemingly related, collegiality represents a sense of community with informal consulting, sharing and open communication whereas teamwork takes the nature of the relationship further including emphasizing the importance of interdisciplinary team-based approaches to learning, planning, decision-making and care for patients. It would be interesting to see whether an emphasis of teamwork would have a greater influence on systems use than was seen for collegiality.

Social network theory and organizational learning theory were used in conjunction with organizational culture theory to suggest pathways through which cultural effects are implemented. Given the use of secondary data, while these additional theories were used to provide a logical explanation for the relationships within the model, direct measures of these theories were not available. So while the results of the analysis based upon the measures used may provide the opportunity to make a general judgment about the relevance of the theories, the best way to directly test the theories would be to create measures specific to the theoretical constructs. For example, in the case of social network theory, measures could be created to represent some of the following dimensions: embeddedness, centrality, strength of ties, direct versus indirect ties, structural equivalence and structural holes (Shortell & Rundall, 2003). Relationships could then be tested between the embeddedness of medial office practices, for example, and their use of practice systems. In the case of organizational learning theory, measures could be created to represent some of the following dimensions: knowledge source, product-process focus, documentation mode, dissemination mode, learning focus, value-

chain focus, and skill development focus (DiBella, Nevis & Gould, 1996). Relationships could then be tested between the learning focus (using methods and tools to improve what is being done and/or testing the assumptions of what is currently being done) of medical office practices, for example, and their use of practice systems. Further discussion on specific types of research questions related to these approaches is included within the future research section, below.

*Theories Chosen*

It is important to also ask whether the theories chosen were appropriate for the study. As organizational culture theory relates the values of an organization to its performance and given its application in previous research, it seemed to have been an appropriate framework to apply here. The results of the study support this, showing that culture does have an influence on practice systems use. More of the question lies with the use of social network theory and organizational learning theory. In general, there seems to be a lack of theories in the literature relating culture to performance. Both of these theories were chosen because they have been used in related types of work with some success. Social network theory and the concept of embeddedness have been used as a framework to help understand innovation diffusion and innovation output at an organizational level (Burns & Wholey, 1993; Galaskiewicz & Wasserman, 1989; Shan, Walker, & Kogut, 1994). Organizational learning theory has been used to understand the likelihood of quality program implementation (Rondeau & Wagar, 2002). Use of these types of "dynamic process-oriented theories" has also been encouraged in previous research recommendations (Hearld et al., 2008). These organizational theories had not,

however, previously been used to explain relationships in smaller organizations such as medical office practices, or used to represent the types of measures seen in this study (Goldberg & Mick, in press). So while in general, given the results of study, the theories did seem to be applicable, follow-on work to develop measures directly related to each of these theories and empirically test them, may help to further clarify their relevance.

In terms of future work, other theories may be more suited to explain such relationships. For example, Shortell and Rundall (2003) recommended the use of strategic adaptation theory in addition to social network theory, in the evaluation of relationship content. Strategic adaptation theory focuses more on the substance of the ties between individuals or organizations and the behavioral actions taken, rather than just the structure of the relationships. Testing hypotheses related to social network theory and strategic adaptation theory would likely require both primary and secondary data collection. The applicability of strategic adaptation theory to organizations such as medical office practices in terms of size and structure also comes into question.

Solberg's model for medical practice improvement may be a more relevant framework in support of this work (Solberg, 2007). This model, which was developed from 30 years of relevant health services research and supplemented with organizational change and quality improvement literature from other industries, focuses on the components necessary in the transformation of medical practices for improved quality of care and patient outcomes. These components include prioritizing quality improvement, promoting a culture in support of change and adopting processes that support improvement, all in the context of relevant internal and external factors. Given this model

relates culture to implementation of care processes for care improvement and it has direct applicability to medical office practices, it may serve to be a more relevant framework to answer related research questions.

Lastly, while not included in the original hypotheses, a look at the data representing practice and respondent characteristics shows that they explain a large amount of the variance. Future work may also include the addition of theory related to the influence of organizational and individual characteristics on organizational behavior. In particular, structural contingency theory, which focuses on the interaction between environment, structure and performance, may be applicable to apply to the structural variables such as practice size.

## Methods Implications

### *Measures Used*

As referenced above, it may be relevant to think critically about the measures used within the study. In terms of their validity and reliability, the measures used for culture and for practice systems were both validated by their original authors. Testing results for the Kralewski culture tool showed that it was able to capture distinct dimensions of practice culture (e.g., collegiality, quality emphasis and autonomy) and identify cultural differences among practices as predicted by organizational theory (Kralewski et al., 1996; Curoe et al., 2003; Kaissi et al., 2004). In addition, in terms of data collection for this study, survey questions were answered not only by physicians, but also by other staff as well (mid-level clinicians, nurses, etc.), adding to the representative nature of the data. Physician-only cultural survey data were seen as a limitation in

previous related studies (Kaissi et al., 2004; Kaissi et al., 2007; Kralewski et al., 2005; Shortell et al., 2001). Given this information, it appears that the data collected for culture is likely an adequate representation of collegiality, quality emphasis and autonomy.

Practice systems survey questions were validated through literature support of their relation to positive outcomes and through their use in medical home evaluation programs. In addition, respondent report of these survey questions was validated by on-site audit. Agreement with the audit ranged across the seven different practice systems from 41%-97% for lead physicians and from 24%-82% for other types of staff. Where non-matches between survey respondent choices and those of the auditors were found, respondents tended to underreport the existence of practice systems, rather than over report them (Solberg et al., 2008). This limitation may have affected this study and underestimated some of the relationships between culture and practice systems. To take this idea further, one can look at the results of the study to see whether any such patterns can be seen. For example, care management systems had the lowest agreement with the audit, and no significant results were seen between any of the culture characteristics and this practice system. If, for instance, this practice system was more accurately captured by survey response data, results may have shown a greater degree of influence of culture on this system. On the other end of the spectrum, clinical quality evaluation and improvement, the system with the highest audit agreement, was seen as significantly related to both collegiality and to quality emphasis. While survey report of practice systems alongside culture may be most practical and cost effective way to gather this

data, future work to explore these relationships may call for additional data collection methods, such as on-site audit, to validate the existence of systems in offices.

### *Endogeneity*

As discussed in the methods section above, if the assumption is made based upon organizational theory that the relationship between culture and structure is interdependent over time, this could mean endogeneity issues exist between the independent variables of collegiality, quality emphasis and autonomy and the practice systems use dependent variables. So while the intent of the study was to test the hypothesized relationship of culture's influence on practice systems use, it could be the case that systems use influences practice culture as well. In terms of addressing this issue, while the inability to do a formal endogeneity analysis given the lack of instrumental variables is a limitation, follow up analysis indicates that the current model may be robust enough to be unaffected by potentially endogenous variables. Nevertheless, the results generated from this study should be interpreted with caution, and further work should be done to understand the extent of the relationships more fully.

As is elaborated upon in the implications for practice and policy section below, there is a strong desire to understand more fully what factors influence the successful adoption and implementation of quality of care programs. While the results of the study suggest culture plays a part in use of these types of systems, the use of these systems may also affect the ways in which values develop within practices. It may be important to further tease out these details before changes in practice are made based upon these types of findings.

In terms of further examination of relationships, one could either choose to focus on the creation of strong instrumental variables as part of the cross-sectional study design or to change the design completely to directly address direction of causality. In general, given the prevalence of cross-sectional studies in health services research, and the push for findings from these studies to guide system change, the availability of strong instrumental variables to address endogeneity issues becomes increasingly important. It seems more attention needs to be paid to the development of these techniques across the field. With respect to the development of instrumental variables for this study, even the addition of medical office practice Zip code data may serve to be beneficial. With the inclusion of this information, the current data set could be linked to data from the primary care service area (PCSA) project, which consists of information about population descriptions, healthcare needs measures and utilization statistics related to primary care. Access to this level of detailed data presents an opportunity for further exploration and identification of possible instrumental variables (Goldberg & Mick, in press). The inclusion of strong instrumental variables within this study could help clarify further the degree and direction of influence between the constructs.

With regard to alternative study designs, a longitudinal study, for example, would allow the researcher to examine variables over time to understand more fully how they are influenced. More specifically, culture characteristics and the existence of practice systems could be measured at multiple points of time to determine which factor influenced the other's progression. Given that both culture and implementation of systems are likely to progress over extended periods of time, this type of study would be

quite an undertaking in terms of time, resource allocation and commitment of study sites. One possible way to gain some efficiencies in this regard would be to do this type of study within the Veteran's Administration where the nature of the organization allows for more control of circumstances or to include this type of study along with related practice systems demonstration projects already being implemented. These demonstration projects are discussed more fully in the next section.

## Implications for Medical Practice and Health Policy

The lack of optimally designed processes and clinical systems to address and improve care for those with preventive or chronic care needs has been cited as an organizational failure in the ambulatory care setting. However, there has been little information formally documented about the extent to which medical office practices are implementing practice systems of care overall (Goldberg & Kuzel, 2009). This study offers specific detail on the use of these systems in medical office practices. It provides further evidence and sheds light on the large variation in use of different types of systems across medical office practices, and that practices in general are not using these types of systems to the degree they could to improve clinical outcomes and patient experience of care (Wagner et al., 2001; Bodenheimer et al., 2002). The information that systems are lacking further supports the promotion of initiatives such as the patient centered medical home (PCMH). The PCMH is an approach to comprehensive primary care that rests on the importance of well developed systems and health information technology to assure patients receive needed care (Patient-Centered Primary Care Collaborative, 2007). The PCMH concept is receiving increasing attention by healthcare payers, purchasers and

policymakers as a promising way to control costs and enhance quality in primary care practices.

In terms of supporting these types of initiatives, importance not only lies in understanding the extent of systems use, but gaining greater insight into factors that may influence the adoption and successful implementation of these systems for cost reduction and quality of care improvement (Goldberg & Mick, in press). In their review of research on how organizational structure and process affect quality of care, Hearld et al. (2008) recommended that future research should, "provide information that system leaders can use for improvement." They suggest that while results about immutable structural variables such as location can help build the literature base and describe the problem further, it does not provide opportunities for change. They suggest that information about factors, variables, or policies controlled or changed is more useful, and when used, may increase the demand for additional work in this realm.

Specifically related to PCMH programs, an initial report from TransforMed, a national demonstration project to test PCMH in sample of family practices, documented that in order for practices to meet requirements that PCMH sets forth, it must be willing to redesign its care model (Nutting et al., 2009). The issue is that there is a dearth of information about what factors are most important when trying to achieve this goal. Previous research has suggested that organizational culture (that relies on strong leadership, an emphasis of quality, a commitment to patients, teamwork and a commitment to accountability) is important in the successful implementation of these types of programs (Bodenheimer et al., 2002; Solberg, Hroscikoski, Sperl-Hillen, Harper,

Crabtree, 2006), but further work is needed to support this preliminary data. To this end, the information gained from this study helps identify and provide further empirical support for mutable practice characteristics that may influence the use of medical office practice systems for care improvement. Based upon the results, practices may want to pay additional attention to the culture in their organizations and nurture both values of collegiality and quality emphasis, while keeping in mind that an emphasis of autonomy did not influence systems use. Focusing on these organizational characteristics may provide an opportunity for intervention and/or change by policy makers and system leaders thereby helping to move further toward practice transformation and care improvement.

While significant results were found between the relationships of collegiality and practice systems and between quality emphasis and practices systems overall, a smaller proportion of significant relationships between these cultural characteristics and individual practice systems was seen. This calls into question whether particular cultural characteristics influence specific practice systems differently. Initial work on culture-structure fit has been done by Kaissi and colleagues. First they found that certain cultural characteristics were more associated with specific quality programs (Kaissi et al., 2004). For example, practices with a quality-centered culture preferred patient experience of care surveys in contrast to more business-oriented practices that relied more on benchmarking and physician profiling. Practices with high collegiality preferred informal peer review, while practices with information emphasis relied on data and information technology to support quality programs. Their research further focused on the influence

of culture, structure, and their relationship to specific outcomes such as medication errors. Interestingly, results showed that the use of certain practice systems was associated with decreased error rates in practices that encourage values such as collegiality and quality emphasis, while in the context of other cultural characteristics, this type of error reduction was not seen. This led to the conclusion that certain practice systems may only be associated with increased quality of care (e.g., medication error reduction) in the face of specific values. Additional work is needed to understand which cultural characteristics influence what types of practice systems and why that is the case. These results have implications for the types of values practices may want to nurture as they work to adopt select quality of care programs.

## Health Services Research Contributions

Where there is an interest in understanding factors that influence performance in health care, the information gained from this study can be used to build the body of literature related to culture, systems of care and the relationship between them, specifically within medical office practices.

This study contributes to our understanding of the use of practice systems in physician offices. More specifically, where there have been few studies evaluating the extent to which medical office practices are implementing systems for care improvement, this study offers specific detail to that regard, and it does so with survey results from a validated instrument. In addition, this research supports findings of the few studies that are available where adoption of certain systems was found to be low (Burt & Sisk, 2005; Casalino et al., 2003b; Goldberg & Kuzel, 2009; Solberg et al., 2005). This study also

provides data on a broader range of practice system types as compared to a limited number of practice systems that have previously been reported on. The information gained from this research supports the notion that practices in general are not using these types of systems to the degree they could to improve clinical outcomes and patient experience of care.

In terms of investigating culture's role, there has been some evidence in the literature to suggest culture may be a relevant factor in the influence of organizational structure and achieving higher quality of care, "yet articulating the nature of that relationship has proven difficult" (Scott et al., 2003c) (p. 105). Scott and colleagues (2003c) suggest this may be due to the considerable variation between studies in terms of design, definitions of variables for culture and performance, and study setting. This study provides information on aspects of medical office practice culture and the relationship of those aspects to the adoption of systems, following recommendations of previous research and using design techniques lacking in previous studies.

Where there have been few studies in health care focusing on culture, and even fewer studies carried out in physician offices, rather than the hospital setting, this research helps to fill that gap. Recommendations from Mitchell & Shortell (1997), who conducted a large-scale review to evaluate the relationship between health care organizational characteristics and the outcomes of adverse events and mortality, advised researchers more than ten years ago to focus on lower level organizations. One of the main reasons is because variation has been seen in both processes and outcomes across these settings, which may mean results may not be generalizable across them. The study

of physician offices is also important, in particular, because it is the type of setting used most often by patients to access health care in the United States for the delivery of both primary and secondary care (National Center for Health Statistics [NCHS], 2006).

In terms of research design, whereas previous studies focusing on health care have not used validated tools for examination of culture or a tool specific to the culture of medical office practices (Hearld et al., 2008; Scott, Mannion, & Davies, 2003b), this study has. Through testing, the instrument used was shown to have face validity and successfully differentiated culture in different types of medical practices (Kralewski, Dowd, Kaissi, Curoe & Rockwood, 2005). In addition, this study incorporated responses from different types of staff within the practice (physicians, mid-level clinicians, nurses), providing a more representative view of culture. Previous studies have focused on responses only provided by physicians (Kaissi et al., 2007; Shortell et al., 2001). In their study examining the relationship between culture and quality of care programs, Kaissi et al. (2007) lists this as a limitation of their study and suggests caution should be taken in terms of interpretation of results from data on culture.

Overall this study is an important contribution to the literature for the following reasons. First, it provides descriptive information about cultural characteristics and systems use in medical office practices. This information can be used as a data point for future tracking and trending of this type of information at the national level as well as for individual medical office benchmarking purposes. The information also substantiates the need for transformation of practices. Second, it provides empirical evidence that there may be a relationship between the cultural characteristics of collegiality and quality

emphasis, and the use of programs to achieve quality of care, and no relationship between autonomy and systems use. This information supports previous research indicating that culture characteristics such as teamwork and an emphasis of quality are both important to the successful implementation of quality programs (Bodenheimer et al., 2002; Kaissi et al., 2004; Kaissi et al., 2007; Solberg et al., 2006), while a focus on autonomy does not influence the use of systems in the same way (Kaissi et al., 2004). Third, results also convey that organizational characteristics such as practice location, ownership and complexity may contribute substantially to the implementation of systems, suggesting that while some influential factors will be mutable, such as culture, other factors, will not.

## Assumptions and Limitations

Although the study has a number of strengths and can potentially provide valuable information, it has several limitations. Some of the same challenges existed with the original published studies surrounding this dataset. In particular, there are limitations with the ability to generalize results. Although the sample of practices was intended to be diverse in size, the practices are rather large in comparison to practices in general. In comparison to national data, medical groups and office practices in Minnesota appear to be somewhat atypical. Unlike most primary care practices in the United States, these groups include more staff overall and more midlevel practitioners and registered nurses (Casalino et al., 2003a). Survey data from research conducted by Casalino et al. have showed that nationally, almost 50% of physicians work in practices of one or two physicians and more than 80% of physicians work in practices of nine or fewer physicians. Contrary to that, primary care in Minnesota has been represented by mostly

large medical groups with few to none having only one to two physicians in a practice. This has mainly been the result of medical group ownership by health plans or hospitals or as a result of mergers (Solberg, 2006). The large sizes of groups have also made it possible for the groups to enjoy the leadership of a medical director and additional administrative support, which has not been as consistent elsewhere (Solberg, 2006). In addition, the practices that participated in this survey were part of a quality collaborative, which may make them different than medical office practices in general in terms of their culture characteristics, prevalence of practice systems and their knowledge of both.

Selection bias may exist in terms of the medical groups and associated practices that chose to participate in the study as compared to those who did not. These populations may be inherently different as related to certain unmeasured characteristics, although overall average response rate of individuals across medical groups was 73% (range of 61% to 94%) which is consistent with or higher than other existing studies recruiting provider organizations in the literature (Solberg, 2006; Kaissi et al., 2004). In addition, for the respondents that submitted completed surveys, there was very little missing data.

Given a cross-sectional analysis was done, one might question whether culture influenced the incorporation and use of practice systems or whether the implementation of practice systems influenced culture. In general, cross-sectional studies have been criticized for raising questions about causality (Hearld et al., 2008) and endogeneity. Analysis results show that there are no variables in this dataset that would make strong instrumental variables for this study. The inability to do a formal endogeneity analysis is

recognized as a limitation of the study, although the support of well-established theories to provide a foundation for the direction of the relationship was used to lesson the threat.

There are limitations inherent in utilizing self-report data. Previous studies have indicated health care personnel are more likely to under-report rather than over-report the existence of practice systems, though this underreporting is likely to underestimate the relationship with practice culture. Answers to questions on culture in particular may be biased by survey respondents choosing the answers they may believe to be those which would reflect the practice in a better light. Also, questions and response choices may be interpreted differently amongst the survey respondents. Finally there is also a potential for perceptual bias, which is a problem that arises when both the dependent and explanatory variables are perceptions of the same person.

It is important to be aware of the limitations, but also to realize they do not negate the usefulness of the findings. Several peer-reviewed articles were published from the original study's findings which highlight acceptance by the research community of the underlying data collection methods. The key is to communicate clearly what was found in light of the caveats and to refrain from over generalizing results.

Although data were collected in 2005, it could be argued that this study focuses on important and lasting questions and it is unlikely that practice culture and structure are unlikely to change quickly. In addition, the results of this study are increasing relevant as more and more physician practices move to the group model.

Given the current policy environment emphasizing the need for the PCMH and the associated interest in improving quality of care, in addition to the call from the

research community for additional studies implemented within medical practices using a theoretical foundation (Hearld et al., 2008), findings from this study will be important to share.

## Future Research

Future research will continue to be needed to advance this area of study. As there was a large range between the reported consistency of use and helpfulness of the practice systems studied, additional work could be done to examine the reasons for this. For example, while utilization was reported as high for systems such as clinical information systems and clinical quality evaluation and improvement, it was reported as very low for care management. It may be helpful to understand why certain systems are adopted and others are not and what other factors play a part in influencing this. Also it would be important to understand whether these factors are mutable or stable over time. One place to start may be to further develop and test the practice level attributes such as location and complexity which were used in this study and found to be positively associated with the adoption of systems. It may also be helpful to know whether if only a certain subset of systems can be adopted, which are the most related to improving quality of care.

Additional work could be done to understand why clinician reminders, clinical quality evaluation & improvement and clinical information systems were the three practice systems found to be influenced by the cultural characteristics studied, and others were not. In addition, while the three culture characteristics of collegiality, quality emphasis and autonomy were thought to be the culture characteristics that may be most related to the use of practice systems, other culture characteristics such as teamwork,

information emphasis, business emphasis and organizational trust, which were found to influence other types practice systems in previous studies, might be studied in relation to these practice systems as well.

In terms of future research questions directly related to the culture of medical office practices, if we believe that culture plays a part in the successful implementation of quality of care programs, should culture be monitored as well as implementation of systems use in the evaluation of medical office practices? If yes, what is the best way to assess what the culture is in these practices? Are culture characteristics really mutable factors? Can practices take an active part in changing their cultures over time? If yes, what is the best way to go about changing culture? Are culture characteristics stable over time? Do they lead to increased quality of care over time? The answers to these questions will be very important if recommendations are made for practices to focus on culture as they work on the transformation of their practices to improve quality of care.

Organizational culture theory in addition to components of social network theory and organizational learning theory were used as a framework to help explain the relationship between cultural characteristics and systems of care within medical practices. As mentioned, while these theories were used to aid in the generation of study hypotheses, a specific empirical study of these theories was not possible. Future research could be done where measures are built directly from the basis of these theories, and tested. As alluded to in the theoretical implications section, in the case of social network theory, one could empirically assess the network structures of the practices in terms of some or all of the following dimensions: embeddedness, centrality, strength of ties, direct

versus indirect ties, structural equivalence and structural holes. More specifically, future research could be designed to answer the question: Is the embeddedness or density of an organization related to the use of practice systems? This could be measured by developing a network diagram which accounts for all the relationships the organization has with other organizations and then counting the number of ties the organization has to other organizations within the network. Embeddedness has been associated with knowledge transfer and innovation implementation (Shan et al., 1994; Gulati et al., Uzzi et al., 1997). Another example of an associated research question is whether the centrality of an organization is related to the use of practice systems? The network diagram would be used again, but would be examined for the amount of resource, information flows and social ties an organization has. Centrality has been associated with innovation use over time (Podolny, Stuart & Hannan, 1996).

In the case of organizational learning theory, one could create measures to represent the following dimensions: knowledge source, product-process focus, documentation mode, dissemination mode, learning focus, value-chain focus, and skill development focus (DiBella, Nevis & Gould, 1996). More specifically, future research could be designed to answer the question: is a medical office practice emphasis on organizational learning related to the use of practice systems? Responses could be collected via survey of office staff to questions related to the different dimensions that make up organizational learning culture. Taken from a survey created Rondeau & Wagar (2002) to assess organizational learning orientation, examples include, to what degree does your organization “make information available to everyone and facilitate an

atmosphere of open communication?" and to what degree does your organization, "spend a lot of effort measuring things before making decisions?"

While the development of these specific kinds of questions and associated measures would help to test the relevance of these theories more specifically, it does not come without a huge resource commitment in terms of a data collection effort. One would need to assess the tradeoffs between expense and information gained.

In terms of the study's generality, while the study's focus on medical office practices in the Minneapolis/St. Paul, Minnesota area which belonged to ICSI may have allowed for such a high response rate, follow on research could be done to expand the population beyond this geography to practices in more diverse locations, with different attributes in order to gather a more representative sample and make results more generalizable. Other data sources and/or data collection methods besides office staff survey responses could also help strengthen this research; particularly as mentioned previously with respect to the existence of practice systems, where self report data has underestimated the use of certain systems within the practices. A more accurate representation of systems use may generate additional significant relationships.

Finally, as research has shown a link between the existence of practice systems and increased quality of care, it would be interesting to investigate the relationship between culture, systems and quality in one study. Examples of associated research questions are, which systems are most related to improvement in quality of care? Are certain culture characteristics needed to achieve quality of care outcomes, or are having the systems of care in place, sufficient?

# Conclusion

Given the existence of a quality gap in clinical practice and the call for increased accountability across healthcare, this study is important and relevant to multiple stakeholders as it focuses on the promotion of processes (systems of care) that have been shown to help achieve quality of care outcomes for priority populations in the ambulatory care setting.

Through this study knowledge was gained about the existence of cultural characteristics and systems of care in medical office practices, and about the relationship between them. As the study shows that culture does influence the use of certain systems for care improvement, it provides an increased understanding, area of focus and avenue for intervention/change in the continued quest for improved quality of care. Policymakers and medical office leadership may want to focus energy on understanding primarily whether the culture of practices places an emphasis on quality. Ultimately it may foster the use of practice systems for quality of care improvement.

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# APPENDIX A.

# PPC-RS SURVEY

# PRACTICE SYSTEMS ASSESSMENT SURVEY©

**Primary Care Version**

**(PSAS-PC)**



June, 2004

We are conducting a study of physician office practices. Your responses will be kept confidential and any report will only include aggregate data across a number of staff members and medical groups.

Please respond to these questions from the perspective of the office/clinic where you spend most of your time.

*Please fill in the oval that best fits your response.*

## I. Clinical Information Systems

**1. Does your office/clinic use either paper or electronic tools for managing the care of patients with chronic conditions?**

| | None | Few/some | Most/all | Don't know |
|---|---|---|---|---|
| a. Problem lists | ○ | ○ | ○ | ○ |
| b. Medication lists | ○ | ○ | ○ | ○ |
| c. Checklists of tests or interventions that are needed for prevention or monitoring of chronic illness | ○ | ○ | ○ | ○ |
| d. Flow sheets that are completed during visits (e.g., diabetic flow sheet - paper or electronic) | ○ | ○ | ○ | ○ |
| e. Written records or print-outs for patients to track symptoms or treatment responses between visits (e.g., record of blood sugar monitoring kept by patients with diabetes) | ○ | ○ | ○ | ○ |
| f. Questionnaire or assessment tool to assess patient interest in changing risk factors or self-care behaviors | ○ | ○ | ○ | ○ |
| g. Clinical guidelines in patient care area | ○ Yes | ○ No | ○ Don't know | |

**2. Does your office/clinic have written guidelines that have been agreed to by physicians for the following conditions?**

| | Yes | No | Don't know |
|---|---|---|---|
| a. Asthma | ○ | ○ | ○ |
| b. Cardiovascular disease (e.g., ischemic, hypertension, or CHF) | ○ | ○ | ○ |
| c. Depression | ○ | ○ | ○ |
| d. Diabetes | ○ | ○ | ○ |
| e. Other (specify) _____ | ○ | ○ | ○ |

**3. Excluding billing, which of these best describes your patient care records and information systems?**

- ○ Paper record only **(PLEASE SKIP TO QUESTION 5)**
- ○ Paper record supplemented with some electronic ordering or data systems (e.g., lab, radiology, prescriptions)
- ○ Electronic medical record with separate ordering or data systems
- ○ Electronic medical record that handles all functions
- ○ Other (please describe) _____

| 4. Please indicate which of the functions are in use in your electronic system for patients seen in this office/clinic site. | Yes | No | Don't know |
|---|---|---|---|
| a. Scheduling | ○ | ○ | ○ |
| b. Laboratory order entry | ○ | ○ | ○ |
| c. Medication order entry | ○ | ○ | ○ |
| d. Information to help physicians choose most effective medications | ○ | ○ | ○ |
| e. Information to help physicians choose medication based on efficiency (e.g., formulary drugs) | ○ | ○ | ○ |
| f. Alerts on drug-drug interactions | ○ | ○ | ○ |
| g. Alerts on disease-drug interactions | ○ | ○ | ○ |
| h. Alerts on abnormal test results that are clinically important | ○ | ○ | ○ |
| i. Ability to search on clinical information in visit notes (e.g., blood pressure) | ○ | ○ | ○ |
| j. Ability to identify patients or retrieve patient information based on a specific chronic condition (search by diagnosis) | ○ | ○ | ○ |
| k. Ability to identify patients on a specific medication | ○ | ○ | ○ |
| l. Ability to search for clinical guidelines | ○ | ○ | ○ |
| m. Other (specify) _____ | ○ | ○ | ○ |

| | Very | Moderately | Somewhat | Not at all |
|---|---|---|---|---|
| 5. How well and consistently do the clinical information systems work at your office/clinic? | ○ | ○ | ○ | ○ |
| 6. How useful and helpful are the clinical information systems in patient care at your office/clinic? | ○ | ○ | ○ | ○ |

## II. Registry

**7. Does your office/clinic have an organized paper or electronic system (often called a registry) to track patients with an specific chronic illnesses or other medical problems?**
Example: a list of all patients with diabetes that can be used to track performance rates for HbA1c rates or levels or to inform patients or staff about patients needing a test

○ **Yes** ○ **No (IF NO, PLEASE SKIP TO QUESTION 12)**

**8. What type of registry does your office/clinic use?**

○ Manual (paper-based) registry
○ Stand alone electronic registry
○ Electronic medical record with registry function
○ Mixed - both paper and electronic registry

**9. Does the registry include all patients in the office/clinic regardless of diagnosis?**

○ Yes ○ No

| | Very | Moderately | Somewhat | Not at all |
|---|---|---|---|---|
| 10. How well and consistently does the chronic disease registry (or registries) work at your office/clinic? | ○ | ○ | ○ | ○ |
| 11. How useful and helpful is the chronic disease registry (or registries) in patient care at your office/clinic? | ○ | ○ | ○ | ○ |

## III. Systematic Monitoring

| 12. Does your office/clinic conduct systematic monitoring for the following patient issues? | Yes | No | Don't know |
|---|---|---|---|
| a. To identify when patients are due for preventive services | O | O | O |
| b. To identify when tests are needed for monitoring a chronic condition | O | O | O |
| c. To identify patients needing follow-up for missed appointments | O | O | O |
| d. To identify when patients are due for follow-up visits | O | O | O |
| e. To identify when patients are due for medication renewals | O | O | O |
| f. To identify whether patients fill prescriptions given to them | O | O | O |
| g. To determine whether planned treatment is consistent with clinical guidelines | O | O | O |
| h. To track laboratory test reports until results return to the office/clinic | O | O | O |
| i. To track radiology reports until results return to the office/clinic | O | O | O |
| j. To track consultation reports until results return to the office/clinic | O | O | O |
| k. Other (specify) _____ | O | O | O |
| l. None of the above - systematic monitoring not used at this office/clinic **(PLEASE SKIP TO QUESTION 16)** | O | O | O |

| 13. For which groups of patients does your office/clinic conduct systematic monitoring? | Yes | No | Don't know |
|---|---|---|---|
| a. All patients | O | O | O |
| **Selected groups** | | | |
| b. Asthma | O | O | O |
| c. Cardiovascular disease (e.g., ischemic, hypertension, or CHF) | O | O | O |
| d. Depression | O | O | O |
| e. Diabetes | O | O | O |
| f. Other (specify) _____ | O | O | O |

| | Very | Moderately | Somewhat | Not at all |
|---|---|---|---|---|
| 14. How well and consistently does systematic monitoring work at your office/clinic? | O | O | O | O |
| 15. How useful and helpful is systematic monitoring for patient care at your office/clinic? | O | O | O | O |

## IV. Clinician Reminders

**16. Does your office/clinic provide reminders to clinicians *at the point of care*?**
Examples: a sticker placed on the chart of patients over the age of 50 to remind the physician or staff if patient has received recommended screening for colon cancer, or use of a standard form that includes a reminder to check the feet of diabetics for sensory loss

O **Yes** O **No (IF NO, PLEASE SKIP TO QUESTION 21)**

| 17. Does your office/clinic provide reminders to clinicians *at the point of care* for the following patient issues? | Yes | No | Don't know |
|---|---|---|---|
| a. Alerts on preventive services needed | ○ | ○ | ○ |
| b. Alerts on tests needed for monitoring a chronic condition | ○ | ○ | ○ |
| c. Alerts on drug-drug interactions | ○ | ○ | ○ |
| d. Alerts on disease-drug interactions | ○ | ○ | ○ |
| e. Alerts on abnormal test results that are clinically important | ○ | ○ | ○ |
| f. Other _____ | ○ | ○ | ○ |

| 18. For which groups of patients does your office/clinic provide clinician reminders? | Yes | No | Don't know |
|---|---|---|---|
| a. All patients | ○ | ○ | ○ |
| **Selected groups** | | | |
| b. Asthma | ○ | ○ | ○ |
| c. Cardiovascular disease (e.g., ischemic, hypertension, or CHF) | ○ | ○ | ○ |
| d. Depression | ○ | ○ | ○ |
| e. Diabetes | ○ | ○ | ○ |
| f. Other (specify) _____ | ○ | ○ | ○ |

| | Very | Moderately | Somewhat | Not at all |
|---|---|---|---|---|
| 19. How well and consistently are the clinician reminders provided at your office/clinic? | ○ | ○ | ○ | ○ |
| 20. How useful and helpful are the clinician reminders in patient care at your office/clinic? | ○ | ○ | ○ | ○ |

## V. Performance Tracking and Feedback

**21. Does your office/clinic collect or use data to track office/clinic performance on patient care in order to compare against established guidelines or key indicators?**
Examples: the average cholesterol LDL level for diabetic patients in your office/clinic, the percent of women over age 50 wi a mammogram in the past two years

○ **Yes** ○ **No (IF NO, PLEASE SKIP TO QUESTION 27)**

**22. Does your office/clinic report the results of performance tracking to clinicians?**

○ **Yes** ○ **No (IF NO, PLEASE SKIP TO QUESTION 27)**

| 23. Do those performance reports include information on the performance of the *overall office/clinic*? Do they report: | Yes | No | Don't know |
|---|---|---|---|
| a. Clinical processes (e.g., % of women 50+ with mammogram) | ○ | ○ | ○ |
| b. Clinical outcomes (e.g., HbA1c levels for diabetics) | ○ | ○ | ○ |
| c. Service data (e.g., waiting times, time to answer phones, etc.) | ○ | ○ | ○ |
| d. Patient reported experience with care (e.g., surveys of patient perceptions of waiting time, staff courtesy, physician listening skills, etc.) | ○ | ○ | ○ |
| e. Other _____ | ○ | ○ | ○ |

| **24. Do those performance reports give information on the *individual clinician's performance?* Do they report:** | Yes | No | Don't know |
|---|---|---|---|
| a. Clinical processes (e.g., % of women 50+ with mammogram) | ○ | ○ | ○ |
| b. Clinical outcomes (e.g., HbA1c levels for diabetics) | ○ | ○ | ○ |
| c. Service data (e.g., waiting times, time to answer phones, etc.) | ○ | ○ | ○ |
| d. Patient reported experience with care (e.g., surveys of patient perceptions of waiting time, staff courtesy, physician listening skills, etc.) | ○ | ○ | ○ |
| e. Other _____ | ○ | ○ | ○ |

| | Very | Moderately | Somewhat | Not at all |
|---|---|---|---|---|
| **25. How well and consistently does performance tracking/reporting work at your office/clinic?** | ○ | ○ | ○ | ○ |
| **26. How useful and helpful are performance tracking and reporting in patient care at your office/clinic?** | ○ | ○ | ○ | ○ |

## VI. Clinical Quality Evaluation and Improvement

**27. In the last 12 months, has your office/clinic conducted any formal clinical quality improvement activities?**
Example: activities to assess and improve key processes and outcomes of clinical care, such as preventive service delivery, control of hypertension, or appointment scheduling procedures

○ **Yes** ○ **No (IF NO, PLEASE SKIP TO QUESTION 30)**

| | Very | Moderately | Somewhat | Not at all |
|---|---|---|---|---|
| **28. How well and consistently does the clinical quality improvement process work at your office/clinic?** | ○ | ○ | ○ | ○ |
| **29. How useful and helpful are clinical quality improvement efforts in patient care at your office/clinic?** | ○ | ○ | ○ | ○ |

## VII. Care Management

**30. Does your office/clinic offer or arrange clinical care management for patients with chronic illnesses?**
Example: care planning and telephone follow-up provided by nurse for all patients with asthma who are on more than two medications; care management can be provided within the physician practice or by a health plan, group practice, or community-based resource

○ **Yes** ○ **No (IF NO, PLEASE SKIP TO QUESTION 35)**

| **31. What proportion of patients at the office/clinic with the following chronic conditions receive care management?** | None | Few/some | Most/all | Don't know |
|---|---|---|---|---|
| a. Asthma | ○ | ○ | ○ | ○ |
| b. Cardiovascular disease (e.g., ischemic, hypertension, or CHF) | ○ | ○ | ○ | ○ |
| c. Depression | ○ | ○ | ○ | ○ |
| d. Diabetes | ○ | ○ | ○ | ○ |
| e. Other (specify) _____ | ○ | ○ | ○ | ○ |



| **32. Which of the following processes or elements are included in the care management services offered to your patients with chronic illnesses?** | None | Few/some | Most/all | Don't know |
|---|---|---|---|---|
| a. Pre-visit planning (e.g., by a nurse, physician, or others involved in patient's care) | ○ | ○ | ○ | ○ |
| b. After-visit follow-up (e.g., by a nurse or care manager) | ○ | ○ | ○ | ○ |
| c. Protocol-based referrals for special services (e.g., diabetes education) | ○ | ○ | ○ | ○ |

| | Very | Moderately | Somewhat | Not at all |
|---|---|---|---|---|
| **33. How well and consistently does the care management process work at your office/clinic?** | ○ | ○ | ○ | ○ |
| **34. How useful and helpful is the care management process in patient care at your office/clinic?** | ○ | ○ | ○ | ○ |

## VIII. About the Respondent and the Clinic/Office

**Please tell us about yourself.**

**35.** What is your age? _____ Years

**36.** What is your gender? ○ **Male** ○ **Female**

**37.** What is your discipline?

○ Physician
○ Nurse practitioner
○ Physician assistant
○ RN
○ LPN
○ Medical assistant
○ Office manager
○ Other (specify) _____

**38a.** If you are a physician, what is your specialty?

○ Internal medicine
○ Family practice/general practice
○ Obstetrics/gynecology
○ Pediatrician
○ Other (specify) _____

**38b.** If you are a physician or mid-level clinician (NP, PA, etc.), what percentage of time do you spend at this office/clinic? _____ % FTE

**39.** Do you serve as quality improvement coordinator/leader/director for this office/clinic? ○ Yes ○ No

**40.** Do you serve as medical director/lead physician for this office/clinic? ○ Yes ○ No

The following questions ask about the extent to which members of a medical group practice share the same values and goals. Please indicate to what extent each of the following statements are true for your office or clinic. The response is on a 1 to 4 scale with 1 = "not at all," and 4 = "to a great extent."

| **Collegiality** | Not at all 1 | 2 | 3 | To a great extent 4 |
|---|---|---|---|---|
| **41.** A great deal of informal consulting | ○ | ○ | ○ | ○ |
| **42.** A great deal of sharing of clinical information | ○ | ○ | ○ | ○ |
| **43.** A close collegial relationship among the physicians | ○ | ○ | ○ | ○ |
| **44.** A strong sense of belonging to the group | ○ | ○ | ○ | ○ |
| **45.** A strong sense of responsibility to help one of our physicians if he/she has a personal problem | ○ | ○ | ○ | ○ |
| **46.** Candid and open communication exists between physicians and nurses | ○ | ○ | ○ | ○ |

| **Quality Emphasis** | Not at all 1 | 2 | 3 | To a great extent 4 |
|---|---|---|---|---|
| **47.** Physicians who develop inappropriate patient care practices will be "talked to" | ○ | ○ | ○ | ○ |
| **48.** We encourage internal reporting of adverse events | ○ | ○ | ○ | ○ |
| **49.** The quality of each physician's work is closely monitored | ○ | ○ | ○ | ○ |
| **50.** There is an open discussion of clinical failures | ○ | ○ | ○ | ○ |
| **51.** We emphasize patient satisfaction | ○ | ○ | ○ | ○ |
| **52.** Quality of care is goal number one | ○ | ○ | ○ | ○ |

| **Autonomy** | Not at all 1 | 2 | 3 | To a great extent 4 |
|---|---|---|---|---|
| **53.** An emphasis on physician individuality; each physician has the right to practice according to his/her own style | ○ | ○ | ○ | ○ |
| **54.** A feeling that we are each autonomous clinicians but practicing in the same organization for support services | ○ | ○ | ○ | ○ |
| **55.** A great deal of tolerance of a physician's idiosyncratic patient care practices | ○ | ○ | ○ | ○ |

**All of your responses will be kept confidential.**
**Please return the completed questionnaire in the enclosed envelope.**

**Thank you for your participation.**

# VITA

Donna Pillittere Dugan was born on July 2, 1975 in Buffalo, New York. She graduated with a Bachelor of Science in Biology from Canisius College in Buffalo, New York in 1997. In 2001, she earned a Master of Science in Epidemiology from the State University of New York at Buffalo after completing relevant coursework and a thesis on factors associated with patient report of physician advice to stop smoking in a managed care population. Related to health care services, she has experience as a medical claims analyst for a third party health insurance plan administrator (TPA) and as a research affiliate and data manager for a New York state run colorectal cancer screening & education program administered by Roswell Park Cancer Institute. Ms. Dugan also completed a fellowship in science writing at the National Cancer Institute (NCI) of the National Institutes of Health (NIH). She spent over 8 years working at the National Committee for Quality Assurance (NCQA) where she was responsible for quality of care performance measure development and maintenance activities for several specific clinical conditions & populations. During the completion of her doctoral studies, she served as an independent consultant and health plan accreditation surveyor/methodologist specific to NCQA's physician hospital quality (PHQ) accreditation program.